AT30 SERIES

Operating and Service Instructions

MICROPROCESSOR-CONTROLLED

FLOAT BATTERY CHARGER

THREE PHASE INPUT

AdTech

Advanced-Technology
microprocessor control

HOW TO READ THE AT30 MODEL NUMBER

Your **AT30** model number is coded to describe the options that are included. Please find the model number on the data nameplate and write it in the spaces provided below. Then follow the chart to determine the configuration of your battery charger.

AT30													
A	B	C	D	E	F	G	H	J	K	L	M	N	P

	DESCRIPTION	CODE	FEATURE
A	SERIES	AT30	AT30 CHARGER
B	NOMINAL DC OUTPUT VOLTAGE	012	12 Vdc
		024	24 Vdc
		048	48 Vdc
		130	130 Vdc
C	NOMINAL DC OUTPUT CURRENT	CODE / FEATURE / CODE / FEATURE	
		0025 / 25 Adc	200 / 200 Adc
		0030 / 30 Adc	250 / 250 Adc
		0040 / 40 Adc	300 / 300 Adc
		0050 / 50 Adc	400 / 400 Adc
		0075 / 75 Adc	500 / 500 Adc
		0100 / 100 Adc	600 / 600 Adc
		0125 / 125 Adc	800 / 800 Adc
		0150 / 150 Adc	1K0 / 1000 Adc
D	FILTERING	U	UNFILTERED
		F	FILTERED
		E	ELIMINATOR
E	AC INPUT VOLTAGE	208	208 Vac 60 Hz
		240	240 Vac 60 Hz
		480	480 Vac 60 Hz
		220	220 Vac 50/60 Hz
		380	380 Vac 50/60 Hz
		416	416 Vac 50/60 Hz

	DESCRIPTION	CODE	FEATURE
F	AC CIRCUIT BREAKER RATING (SEE TABLE)	S	STANDARD
		M	MEDIUM AIC
		H	HIGH AIC
		0	NO AC BREAKER
G	AC FUSES (200 KAIC)	F	SUPPLIED
		X	NOT SUPPLIED
H	DC CIRCUIT BREAKER RATING (SEE TABLE)	S	STANDARD
		M	MEDIUM AIC
		H	HIGH AIC
		0	NO DC BREAKER
J	DC FUSES (20 KAIC)	F	SUPPLIED
		X	NOT SUPPLIED
K	AUX ALARM RELAY BOARD	A	SUPPLIED
		X	NOT SUPPLIED
L	GROUND PAD	G	SUPPLIED
		X	NOT SUPPLIED
M	LIGHTNING ARRESTOR	L	SUPPLIED
		X	NOT SUPPLIED
N	TREATMENTS	F	FUNGUS PROOFING
		S	STATIC PROOFING
		X	NOT INCLUDED
P	DRIP SHIELDS	D	INSTALLED
		X	NOT SUPPLIED

INPUT AND OUTPUT CIRCUIT BREAKER INTERRUPTING RATINGS

CODE	TYPE	AC RATINGS (208/240/480 Vac)	DC RATINGS (125 Vdc)	DC RATINGS (250 Vdc)
S	STANDARD	5,000 AIC	5,000 AIC	–
M	MEDIUM AIC	25,000 AIC	10,000 AIC	10,000 AIC
H	HIGH AIC	65,000 AIC	25,000 AIC	25,000 AIC

NOTE:

The model number listed on the charger data nameplate does not include any field-installed options. Also, certain accessories are not included in the model number, even if they are shipped with the charger. Check off below any accessories that were included, or that you install yourself.

- ☐ Wall/rack mounting brackets
- ☐ Lockable enclosure door
- ☐ Cabinet heater strips
- ☐ NEMA-4/12/13 type enclosure
- ☐ Auxiliary alarm terminal block
- ☐ External temperature compensation probe
- ☐ Analog ac voltmeter
- ☐ Analog ac ammeter
- ☐ Ground detection dc voltmeter w/switch
- ☐ DNP3 Level 2 / Modbus communications module

Please find the serial number on the data nameplate and record it here: ☐

IMPORTANT SAFETY INSTRUCTIONS

READ AND FOLLOW ALL SAFETY INSTRUCTIONS

1. Before using this equipment, read all instructions and cautionary markings on: A) this equipment, B) battery, and C) any other equipment to be used in conjunction with this equipment.
2. This manual contains important safety and operating instructions, and therefore should be filed for easy access.
3. Remove all jewelry, watches, rings, etc. before proceeding with installation or service.
4. Do not touch any uninsulated parts of this equipment, especially the input and output connections, as there is the possibility of electrical shock.
5. During normal operation, batteries may produce explosive gas. Never smoke, use an open flame, or create arcs in the vicinity of this equipment or the battery.
6. Maintain at least 6in / 152mm clearance from all obstructions on the top, bottom and sides of this equipment. Allow sufficient clearance to open the front panel for servicing.
7. Turn this equipment off before connecting or disconnecting the battery to avoid a shock hazard and/or equipment damage.
8. Connect or disconnect the battery only when the battery charger is off to prevent arcing or burning.
9. De-energize all ac and dc inputs to the battery charger before servicing.
10. Do not operate battery charger if it has been damaged in any way. Refer to qualified service personnel.
11. Do not disassemble battery charger. Only qualified service personnel should attempt repairs. Incorrect reassembly may result in explosion, electrical shock, or fire.
12. Do not install the battery charger outdoors, or in wet or damp locations unless specifically ordered for that environment.

SAVE THESE INSTRUCTIONS

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ADDITIONAL DOCUMENTATION
1. Custom Parts Data Package
2. Custom Record Drawing Package
   2.1. JE5075 AT30 SERIES BATT CHGR DRAWING LIST / DATA NAMEPLATE DETAIL
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   2.4. JE5091 AT30 SERIES INSTRUMENT PANEL / PC BOARD DETAIL
   2.5. JE5092 AT30 SERIES BATTERY CHARGER SCHEMATIC
   2.6. JE5093 AT30 SERIES BATTERY CONNECTION DIAGRAM

***Note**: In lieu of standard replacement part tables* and standard drawings** within this manual, all AT30s currently ship with a custom Parts Data Package and a custom Record Drawing Package.*

1. RECEIVING THE AT30

1.1. STORING THE AT30

If you store the AT30 for more than a few days before installation, you should store it in its original shipping container, and in a temperature controlled, dry climate. Ambient temperatures of 32 to 122° F / 0 to 50° C are acceptable. Storage should not exceed 2 years due to the limited shelf life of the dc filter capacitors when they are not in service.

1.2. REPORTING SHIPPING DAMAGE

If, on delivery of the AT30 or related goods, you discover any damage or shortage, make notation on all copies of delivering carrier's delivery receipt before signing, and notify the delivery person of your findings. If loss or damage is discovered after delivery, notify delivering carrier immediately and request an inspection. The manufacturer does not assume any liability for damage during transportation or handling.

Should the goods require an inspection by or return to the manufacturer, please contact your sales representative for further instructions. Any returned material must be properly packed in compliance with shipping regulations. It is preferable to use the original shipping materials if possible. Mark the outside of the shipping container with the Return Material Authorization (RMA) number issued by the manufacturer.

1.3. UNPACKING AND INSPECTING THE AT30

Carefully remove all shipping materials from the AT30. Remove the AT30 from the shipping pallet for inspection. Save all shipping materials until you are sure that there is no shipping damage.

Once the AT30 is unpacked, inspect the unit for possible shipping damage, using the checklist below. If shipping damage has occurred, refer to section 1.2 on this page for proper reporting.

INSPECTION CHECKLIST

- ☐ Enclosure exterior and interior are not marred or dented.
- ☐ There is no visible damage to exterior or interior components.
- ☐ All internal components are secure.
- ☐ Printed circuit boards are firmly seated on their standoffs.
- ☐ All hardware is tight.
- ☐ All wire terminations are secure.
- ☐ The User's Manual is included.
- ☐ You received all items on the packing list.

1.4. MOVING THE AT30

Once you have established that the AT30 is undamaged, identify the enclosure style and weight of your unit. Refer to the table below.

AT30 Enclosure Type And Shipping Weight Table
Standard Cabinet Styles (**5018** / **5030** / **5031**)

Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	n/a	n/a	n/a	5018
30 Adc	n/a	n/a	n/a	5018
40 Adc	n/a	n/a	n/a	5018
50 Adc	5018	5018	5018	5018
75 Adc	5018	5018	5018	5018
100 Adc	5018	5018	5018	5018
125 Adc	5018	5018	5018	5030*
150 Adc	5018	5018	5018	5030*
200 Adc	5018	5018	5018	5030*
250 Adc	5030*	5030*	5030*	5030*
300 Adc	5030*	5030*	5030*	5030*
400 Adc	n/a	5030*	5030*	5031**
500 Adc	n/a	5030*	5031**	5031**
600 Adc	n/a	5030*	5031**	5031**
800 Adc	n/a	5031**	5031**	5031**
1,000 Adc	n/a	5031**	5031**	5031**

Comprehensive AT30 cabinet weight information is not available at this time. Refer to the custom outline drawing and other documentation supplied with the unit for particular AT30 battery charger shipping weight and/or custom enclosure type. Actual unit is approximately 20 lbs / 9kg below listed shipping weight. Style-163 and Style-198 enclosures may be substituted for Style-5030 and Style-5031 enclosures respectfully. Please refer to the table below for the appropriate physical layout drawing.

Enclosure	Outline Drawing	Internal Drawing
Style-5018	JE5085-######	JE5088-######
* Style-163	JE5095-######	JE5098-######
** Style-198	JE5096-######	JE5099-######

The standard AT30 enclosures do not feature lifting eyes for moving. Instead, whenever possible move the unit with a forklift truck using the supplied shipping pallet. To hoist the unit into a wall-mount or rack-mount location, use a heavy-duty sling applicable to the enclosure size and unit weight. To relocate the enclosure, use a forklift truck by lifting the unit through the gap located between the mounting legs.

1.5. MOUNTING THE AT30

Chose the mounting method for the unit enclosure from the table below.

MANUAL SECTION	MOUNTING METHOD	ENCLOSURE Style-5018	ENCLOSURE Style-5030/5031
1.5.1	Floor-Mounting	**STANDARD**	**STANDARD**
1.5.2	Wall-Mounting	OPTIONAL	n/a
1.5.3	19in / 483mm Rack-Mounting	n/a	n/a
	23-24in / 584-610mm Rack-Mounting	OPTIONAL	n/a

1.5.1. Floor-Mounting the AT30 (standard)

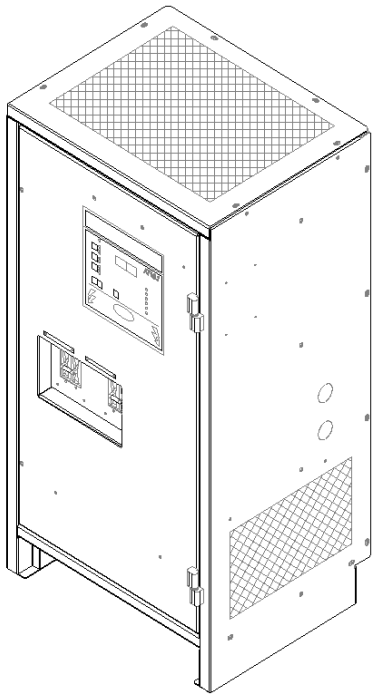
To floor mount the AT30, you must locate the anchor-bolt holes at least 4.25in / 108mm from any wall, to allow clearance for the charger enclosure behind the mounting brackets. In addition, you must consider the following:

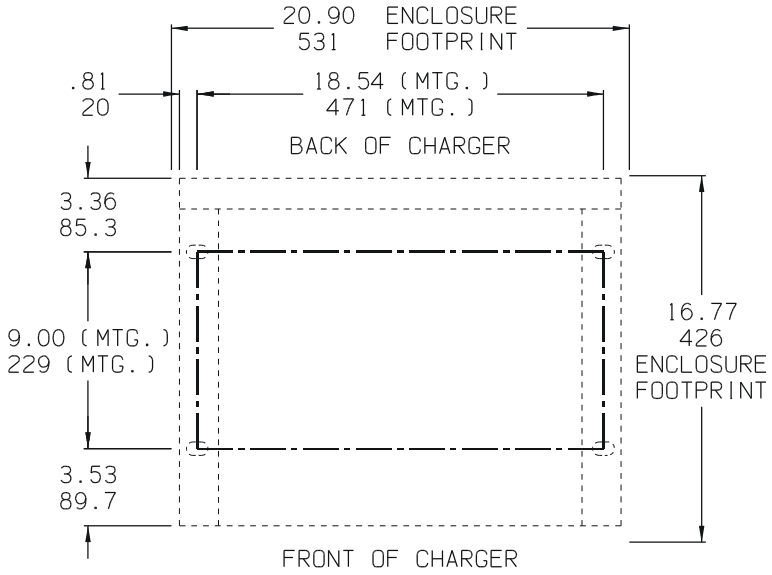
1. Floor-mounting the Style-5018, 5030 & 5031 enclosures is standard.
2. Placement of conduit entrances. Note the standard pre-fab conduit knockouts located on the sides of the charger. See outline drawings in Appendix C.
3. The location:
   - Should be free of drips and splatter. If dripping liquids are a problem, install a drip shield. See ordering information in Appendix B on page 73.
   - Should be between 32 and 122 °F / 0 and 50 °C, with relative humidity between 5 and 95% non-condensing.
   - Must be free of flammable or explosive materials.
4. Maintain at least 6in / 152mm of free air on top, bottom and both sides for cooling air.
5. Allow 36in / 914mm front clearance for access to the charger for operation and maintenance.

PROCEDURE (Style-5018)

To floor-mount the AT30, install four (4) .25in / 6.4mm bolts into the floor. Place the AT30 on the bolts, add appropriate mounting hardware, and tighten securely. See the diagram below for the Style-5018 enclosure footprint and floor-mounting pattern.

Dimensions are in/mm.





NOTE:

For further enclosure size, mounting dimensions and specifications of the AT30 **Style-5018** enclosure, refer to the custom outline drawing (**JE5085-**######) supplied with the unit.

PROCEDURE (Style-5030)

To floor-mount the AT30, install four (4) .25in / 6.4mm bolts into the floor. Place the AT30 on the bolts, add appropriate mounting hardware, and tighten securely. See the diagram below for the Style-5030 enclosure footprint and floor-mounting pattern.

need perspective image of **Style-5030** enclosure

Dimensions are in/mm.

need footprint drawing of **Style-5030** enclosure with mounting dimensions

NOTE:

For enclosure sizes, mounting dimensions and specifications on all other AT30 enclosures (standard and custom) refer to the custom outline drawing (**JE5086**-#######) supplied with the unit.

PROCEDURE (Style-5031)

To floor-mount the AT30, install four (4) .25in / 6.4mm bolts into the floor. Place the AT30 on the bolts, add appropriate mounting hardware, and tighten securely. See the diagram below for the Style-5031 enclosure footprint and floor-mounting pattern.

need perspective image of **Style-5031** enclosure

Dimensions are in/mm.

need footprint drawing of **Style-5031** enclosure with mounting dimensions

NOTE:

For enclosure sizes, mounting dimensions and specifications on all other AT30 enclosures (standard and custom) refer to the custom outline drawing (**JE5087**-#######) supplied with the unit.

1.5.2. **Wall-Mounting the AT30** (Style-5018 enclosure only)

In planning for wall mounting of the AT30 consider the following:

1. If you are wall-mounting a charger in the Style-5018 enslosure, you need the wall mounting bracket kit (part number EI5008-00). For kit availability see ordering information in Appendix B on page 73. The kit includes dimensions and instructions for locating the wall mounting holes.
2. The wall must be strong enough to properly support the weight of the AT30. The weight of your AT30 may be different from the table value, depending on options or accessories you ordered. See the Weight Table located in section 1.4 on page 3.
3. Placement of conduit entrances. Note the standard pre-fab conduit knockouts located on the sides of the charger. See outline drawings in Appendix C.
4. The location:
   - Should be free of drips and splatter. If dripping liquids are a problem, install a drip shield kit. For kit availability see ordering information in Appendix B on page 73.
   - Should be between 32 and 122 °F / 0 and 50 °C, with relative humidity between 5 and 95% non-condensing.
   - Must be free of flammable or explosive materials.
5. Maintain at least 6in / 152mm of free air on top, bottom and both sides for cooling air.
6. Allow 36in / 914mm front clearance for access to the charger for operation and maintenance.

PROCEDURE

To wall-mount the AT30, install eight (8) .25in / 6.4mm bolts on the wall rated to support the AT30 weight plus a safety factor of at least 2 times. Place the AT30 on the bolts, add appropriate mounting hardware, and tighten securely. See the diagram below for the Style-5018 enclosure footprint and wall-mounting pattern.

need perspective image of **Style-5018** enclosure with wall-mounting brackets

Dimensions are in/mm.

need footprint drawing of **Style-5018** enclosure with wall-mounting brackets featuring mounting dimensions

NOTE:

For enclosure sizes, mounting dimensions and specifications on all other AT30 enclosures (standard and custom) refer to the custom outline drawing (**JE5085**-#######) supplied with the unit.

1.5.3. Rack-Mounting the AT30 (Style-5018 enclosure only)

AT30 battery chargers housed in the Style-5018 enclosure can be installed in most relay racks with standard EIA hole spacing. A relay rack-mounting kit (EI0193-03) is required. For kit availability see ordering information in Appendix B on page 73.

Each kit includes mounting brackets, hardware and the necessary instructions to install one AT30 battery charger. The kit also includes dimensions and detailed instructions for rack-mounting.

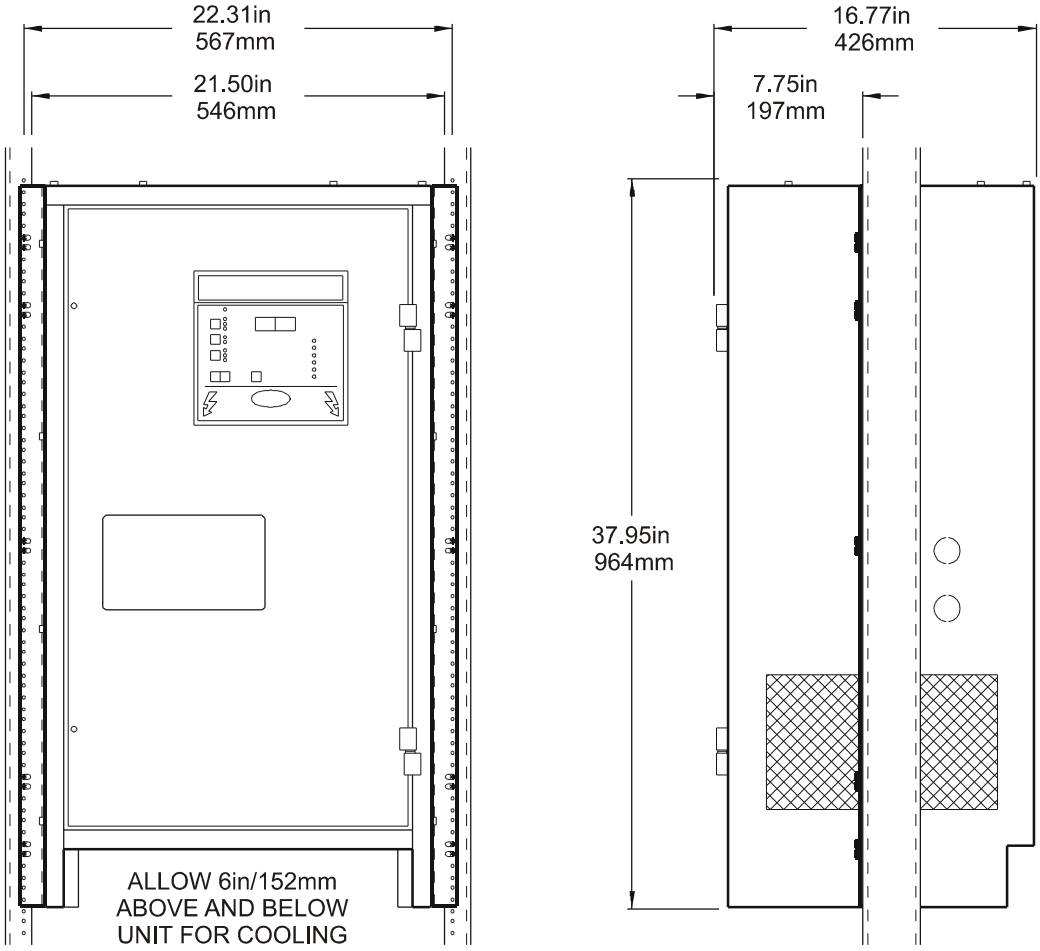
When rack mounting the AT30, you must consider the following:

1. The rack must be strong enough to properly support the weight of the AT30. See the Weight Table located in section 1.4 on page 3.
2. Placement of conduit entrances (be sure the knockouts on the sides or bottom of the charger are accessible after the charger is rack mounted).
3. The location:
   - Should be between 32-122° F / 0-50° C, with relative humidity between 5 and 95% non-condensing.
   - Must be free of flammable or explosive materials.
4. Maintain at least 6in / 152mm of free air on top, bottom and both sides for cooling air.
5. Allow 36in / 914mm front clearance for access to the charger for operation and maintenance.

PROCEDURE

To rack mount the AT30, first install the brackets into the rack using the supplied hardware. Second, install the AT30 onto the brackets. Tighten all hardware securely. Provide at least 6in / 152mm of free air space above and below the AT30 enclosure in the rack for cooling. You do not need to modify the AT30 enclosures for standard rack-mounting. See the diagrams below for the Style-5018 enclosure rack-mounting configuration.

Style-5018 Rack-Mounting



NOTES:

1. Units are installed from the front.
2. For enclosure sizes, mounting dimensions and specifications on all other AT30 enclosures (standard and/or custom) refer to the custom outline drawing (**JE5085**-######) supplied with the unit.

1.6. CHANGING THE TRANSFORMER TAPS

IMPORTANT: The AT30 Battery Charger is designed for a single ac supply voltage. Note the ac voltage listing on the data nameplate and the tag attached to the front panel. If your particular ac supply voltage does not match your AT30 ac input requirements, you MUST change the ac input circuit breaker (and/or fuses) and the input surge suppressors. In addition, you must replace or rewire the transformer as described below. Failure to use the properly rated components may damage the charger.

***NOTE**: If your AT30 Battery Charger was ordered with 480 Vac - 60Hz input or 220 Vac - 50/60 Hz input the transformer accepts only the listed voltage. Do not attempt to rewire these transformers. If a different ac input voltage is desired for the AT30, please contact your sales representative for ordering replacement parts.*

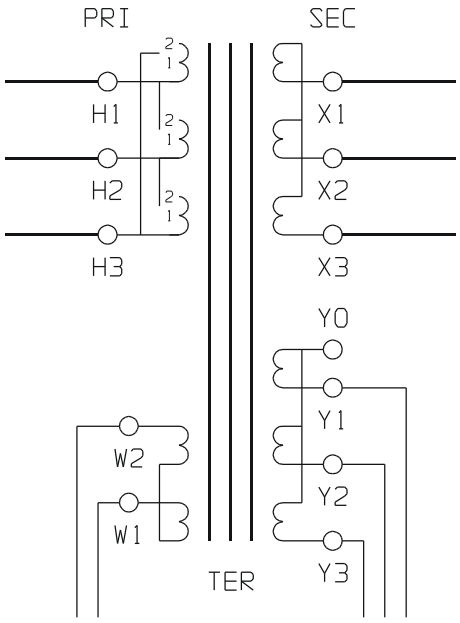
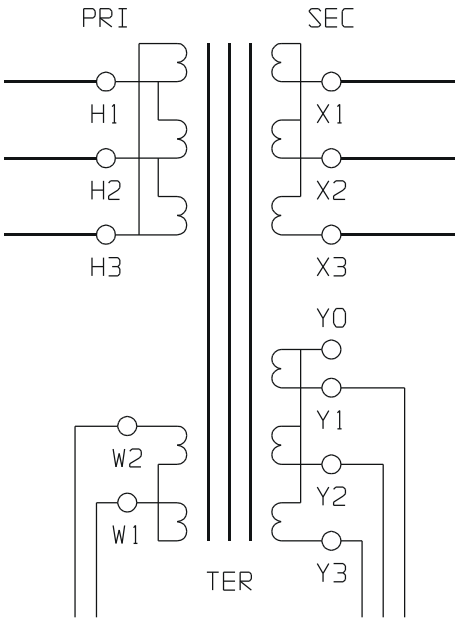
Before you connect ac power to the AT30, check the wiring of the main transformer (T1) to be sure it is connected for the desired ac input voltage. The main transformer was wired at the factory for the input voltage specified and listed on the data nameplate.

If your AT30 was ordered with 208/240 Vac - 60Hz input and you need to change the factory-wired input voltage, do so by changing the jumpers on the main transformer (T1). If your AT30 was ordered with 380/416 Vac - 50/60 Hz and you need to change the factory-wired input voltage, please consult the factory for special instructions.

NOTE: Before starting work, disconnect and lock out all external ac and dc power sources to the AT30. Note that just turning off the front panel ac and dc circuit breakers is not sufficient to eliminate live voltages inside the enclosure. Use a voltmeter at the ac terminals TB1-L1, TB1-L2 & TB1-L3 (ac), and the dc terminals TB1(+), TB1(-), the remote sense terminals (+/-), and any external wiring, to alarm relay contacts to verify that no voltage is present inside the enclosure.

Verify that all voltages within the enclosure are de-energized and locked out. See section 3.5 for necessary steps to follow when accessing internal components within the AT30. Change the jumpers on the main transformer (T1) as shown in the table below.

MAIN TRANSFORMER (T1) CONNECTION TABLE

TYPICAL TRANSFORMER (T1) **208/240** Vac - **60** Hz INPUT		TYPICAL TRANSFORMER (T1) **480** Vac - **60** Hz INPUT
208 Vac Jumper Setting	240 Vac Jumper Setting	Jumper Setting
H1, H2, H3 to 1	H1, H2, H3 to 2	NONE
SCHEMATIC		**SCHEMATIC**
		

PROCEDURE

1. Be sure all voltages are de-energized and locked out.
2. Always use all three (3) jumpers.
3. Be sure all connections are tight. Check your work before reenergizing the charger.
4. For further information, refer to the custom AT30 Schematic (**JE5092**-######) supplied with the unit.

1.7. MAKING THE AC INPUT CONNECTIONS

Follow these steps to connect ac power to the AT30:

1. Use a branch circuit breaker or fused disconnect switch, properly sized for the maximum input current of the AT30, as shown in the table below. This device should have lockout capability so that the ac input can be de-energized and locked out for maintenance. A time delay circuit breaker or slow-blow fuse is recommended.

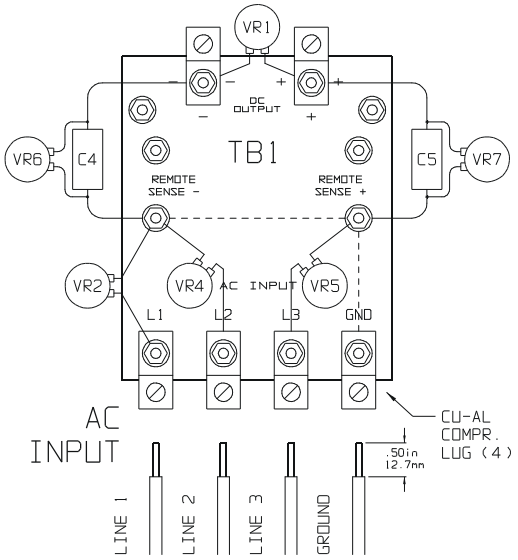
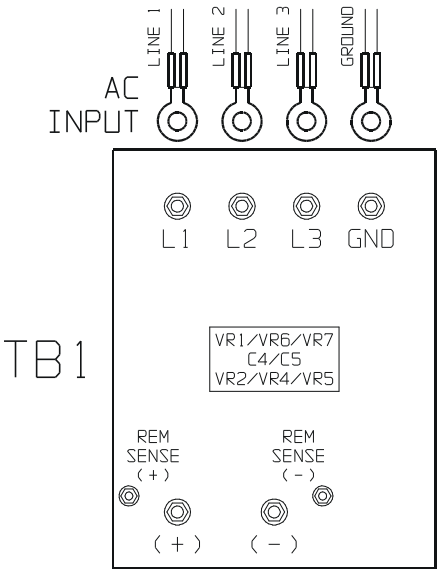
NOTE: If your charger is wired for 480 Vac input, and is equipped with the standard AIC ac circuit breaker (no ac fuses), you need a feeder breaker or fuse rated to interrupt the short-circuit current of your ac supply.

2. Size the ac input wiring per the National Electric Code (NEC) and local codes for the rating of the branch circuit breaker or fused disconnect switch.
3. All specific requirements of your facility take precedence over these instructions.
4. Be sure the AT30 main transformer (T1) is properly connected for your ac input voltage. See section 1.6 for details.

PROCEDURE

1. Remove the safety cover.
2. Run the ac wiring to terminals TB1-L1, TB1-L2, TB1-L3 and TB1-GND on the I/O panel board in the enclosure.
3. AT30 units in Style-5018 enclosures are supplied with CU-AL compression lugs for your convenience, accepting wire sizes #14-1/0 AWG. These ac lugs are located at the **bottom** of the I/O terminal board (TB1). To make these connections, strip the insulation .5in / 12.7mm on the incoming ac wires and connect the wires to the appropriate lugs as shown on the next page. Using a flat-head screwdriver, securely tighten the compression screws on the lugs to 35-50 in-lb / 4.0-5.7 Nm.
4. AT30 units in Style-5030 & Style-5031 enclosures are supplied with 0.375-16 zinc-plated steel (ZPS) stud hardware, accepting appropriately sized customer wiring. These ac studs are located at the **top** of the I/O terminal board (TB1). To make these connections, crimp a 0.375 ring lug onto the incoming ac wires and connect the lugs to the appropriate studs as shown on the next page. Using socket-wrench, securely tighten the stud hardware.
5. Reinstall the safety cover after you have made and checked all connections.

MAKING THE AC INPUT CONNECTIONS - GRAPHICS

I/O Terminal Board (TB1) Detail **Style-5018**	I/O Terminal Board (TB1) Detail **Style-5030 / Style-5031**
	

NOTES:

1. The drawings above do not show other components mounted to the I/O panel. Be careful not to disconect any other component leads.
2. Always use a proper ground.
3. Wire insulation must be rated for 194° F / 90° C or better.
4. Use copper or aluminum conductors only.
5. For I/O Panel layout and all wire terminal specifications, refer to the custom Internal Component Layout Drawing (**JE508x**-######) supplied with the unit.

1.8. MAKING THE DC OUTPUT CONNECTIONS

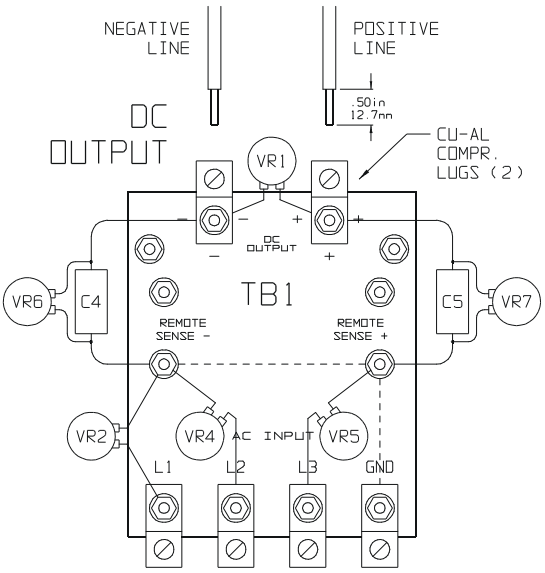
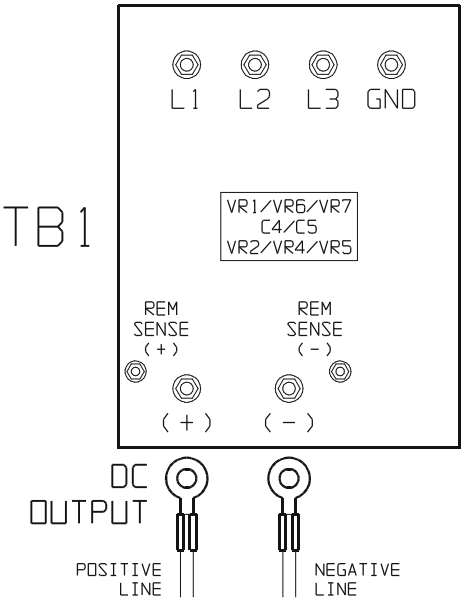
Follow these steps to connect the battery to the AT30:

1. Size the dc wiring to minimize voltage drop. The acceptable wire size depends on your installation. As a guideline, the voltage drop should not exceed 1% of nominal output voltage at full current.
2. Size the dc output wiring per your battery manufacturer's specifications and local codes for the rating of the batteries and/or load.
3. All specific requirements of your facility take precedence over these instructions.
4. The AT30 is factory wired to regulate the output voltage at the output terminals. If the total voltage drop is greater than 1% (e.g., 1.3V for a 130 Vdc system), remote sense wiring is recommended, see section 1.9.

PROCEDURE

1. Use a dc disconnect switch or circuit breaker between the AT30 and dc bus. This device should have lockout capability to allow the AT30 to be disconnected from the dc bus for maintenance.
2. Remove the safety cover.
3. Run the dc wiring to terminals TB1(+) and TB1(-) on the I/O panel board in the enclosure.
4. AT30 units in Style-5018 enclosures are supplied with CU-AL compression lugs for your convenience, accepting wire sizes #14-1/0 AWG. These dc lugs are located at the **top** of the I/O terminal board (TB1). To make these connections, strip the insulation .5in / 12.7mm on the incoming ac wires and connect the wires to the appropriate lugs as shown on the next page. Using a flat-head screwdriver, securely tighten the compression screws on the lugs to 35-50 in-lb / 4.0-5.7 Nm.
5. AT30 units in Style-5030 & Style-5031 enclosures are supplied with 0.375-16 zinc-plated steel (ZPS) stud hardware, accepting appropriately sized customer wiring. These ac studs are located at the **bottom** of the I/O terminal board (TB1). To make these connections, crimp a 0.375 ring lug onto the incoming ac wires and connect the lugs to the appropriate studs as shown on the next page. Using socket-wrench, securely tighten the stud hardware.
6. Reinstall the safety cover after you have made and checked all connections.

MAKING THE DC OUTPUT CONNECTIONS - GRAPHICS

I/O Terminal Board (TB1) Detail **Style-5018**	I/O Terminal Board (TB1) Detail **Style-5030 / Style-5031**
	

NOTES:

1. The drawing above does not show other components mounted to the I/O panel. Be careful not to disconect any other component leads.
2. Always use a proper ground.
3. Wire insulation must be rated for 194° F / 90° C or better.
4. Use Copper or aluminum conductors only.
5. For I/O Panel layout and all wire terminal specifications, refer to the custom Internal Component Layout Drawing (**JE508x**-######) supplied with the unit.

1.9. WIRING THE AT30 FOR REMOTE SENSING

You can wire the AT30 to regulate the output voltage at the battery terminals, instead of at the charger output terminals. Remote sensing does the following:

1. Compensates for voltage drop in the dc wiring between the AT30 and the battery.
2. Directly monitors the battery or dc bus voltage. The front panel meter displays the actual voltage on the battery or dc bus.

You wire the AT30 for remote sensing by installing a two-wire cable from the AT30 remote sense terminals to the battery terminals. The AT30 control circuitry then measures the dc voltage at the battery terminals, and controls the output of the charger to maintain the battery voltage at the desired float or equalize voltage.

*NOTE: If the remote sense wiring fails, the AT30 detects the fault, and displays **E 06** on the front panel meter. See section 3.2 for details.*

CAUTION: The AT30 cannot protect against short circuits in the remote sense wiring. You should install a 1.0A fuse at the battery or dc bus end of the remote sense cable.

To wire the AT30 for remote sensing, follow the procedure and diagram on the next page.

If you ever need to disable remote sense, follow the steps below:

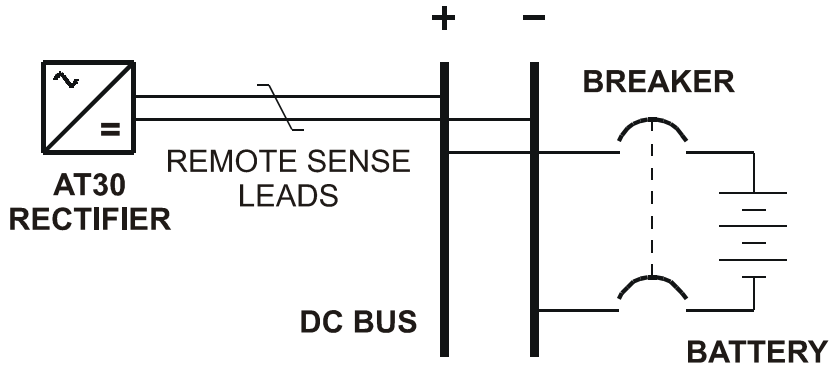
- De-energize and lock out all ac and dc voltages to the AT30. Check with a voltmeter.
- Disconnect the remote sense wires from the battery or dc bus terminals first.

CAUTION: You must do the steps above first.

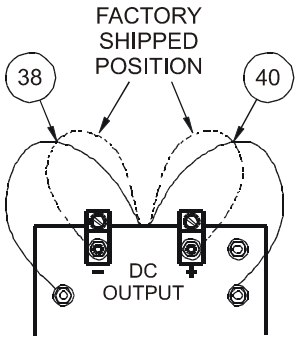
- Remove the remote sense leads from the remote sense (+) and (-) terminals on the I/O panel. Insulate each lead separately. Coil up the wires and leave them in the bottom of the charger, in case you want to wire for remote sense again in the future.
- Reconnect wire # **40** to the dc output (+) terminal.
- Reconnect wire # **38** to the dc output (-) terminal.
- Restart the AT30 according to the instructions in section 2.1.

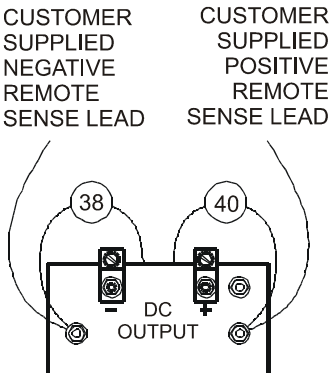
PROCEDURE

1. De-energize and lock out all ac and dc voltages within the AT30 enclosure. Check with a voltmeter.
2. Remove safety shield.
3. Wire the AT30 remote sense to the dc bus as shown in the figure below.



4. Move wires #**38** and #**40** from the TB1 (-) and (+) dc output terminals to the corresponding remote sense terminals as shown in the lower left figure.
5. Connect the external remote sense leads from the battery or dc bus to the remote sense terminals on the I/O panel as shown in the lower right figure.
6. Check your work thoroughly. Replace the safety shield before reeneregizing the charger.
7. Restart the AT30 according to the instructions in section 2.1.





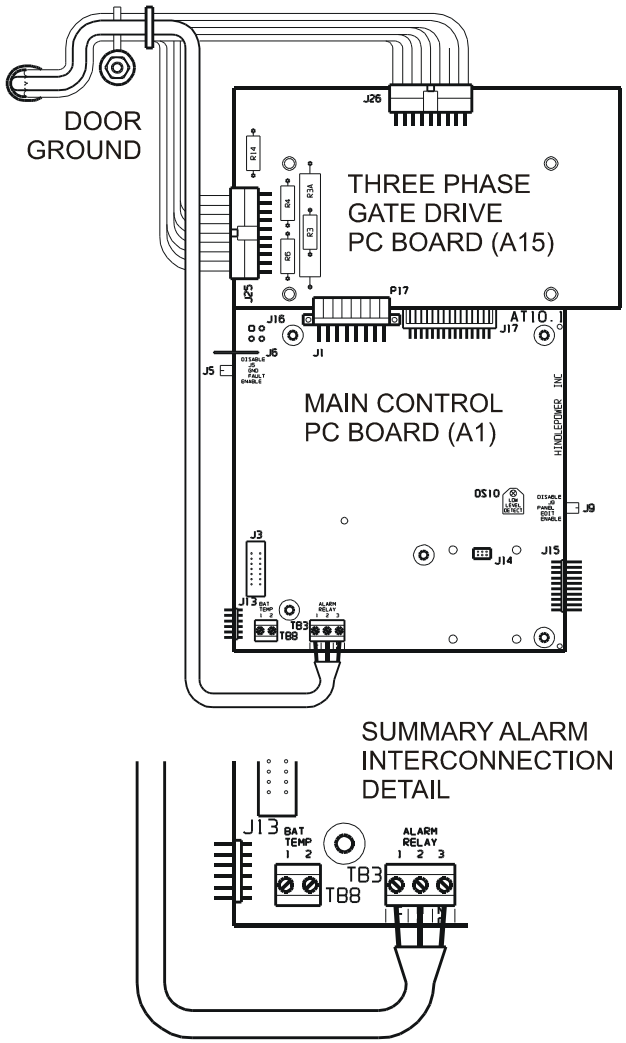
NOTES:

1. Use #16 AWG. twisted pair.
2. Maximum current is 150 mA.
3. Run leads in their own conduit.
4. Fuse the wiring at the battery or dc bus.
5. For I/O Panel layout and all wire terminal specifications, refer to the custom Internal Component Layout Drawing (**JE508x**-######) supplied with the unit.

1.10. WIRING TO THE REMOTE ALARM CONTACTS

Built-in Common Alarm Relay

The Common Alarm relay, located on the main control circuit board on the back of the door, provides one form C summary alarm contact that transfers for any alarm. Follow the procedure below to wire an annunciator to this contact. See section 2.2.7 for a description of the alarm functions.



PROCEDURE

1. Allow 30in / 762mm of wire inside the enclosure (excess will be trimmed).
2. Route wires to front door by following the existing harness through the door hinge as shown. Use (2) wire ties and allow a 4-6in / 102-153mm loop for the hinge.
3. Trim wires to the proper length for connecting to TB3. Strip .25in / 6.4mm of insulation from the wires. Make the connections at TB3, and securely tighten the screws.

NOTES:

1. Alarm contacts are rated at 0.5A / 125 Vac or Vdc.
2. Terminal block is a compression type, accepting wire sizes #22-14 AWG.
3. Terminals are labeled in non-alarm condition.

Auxiliary Relay Board *(optional)*

The Auxiliary Relay Board is located in the main wiring compartment, behind the safety shield. This board provides two form C contacts for each of the following individual alarms:

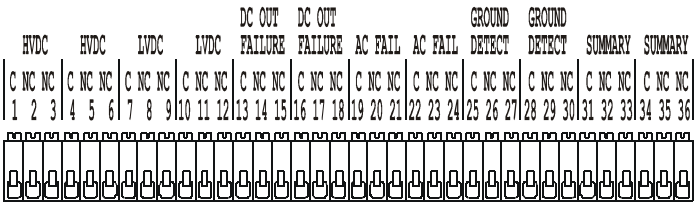
- High DC Voltage
- Low DC Voltage
- DC Output Failure
- AC Failure
- Ground Fault Detection (positive or negative)
- Summary Alarm

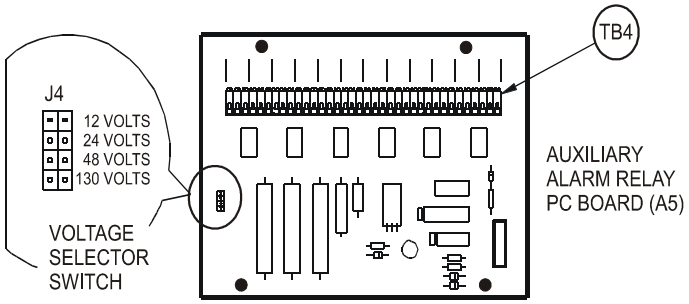
Follow the procedure below to wire annunciators to one or more of these alarm contacts.

PROCEDURE

1. Deenergize and lock out all ac and dc voltages to the AT30. Check with a voltmeter.
2. Remove the safety shield.
3. Route your remote annunciator wiring into the enclosure through one of the unused knockouts in the side of the enclosure.

TB4 TERMINAL BLOCK (2 FORM-C) CONTACTS





4. Connect wiring to the appropriate terminals of TB4 on the Auxiliary Relay board (as shown in the drawing above). Strip each wire .25in / 6.4mm and securely tighten the terminal screws. The terminals are labeled in the non-alarm condition.
5. Replace the safety shield.

NOTES:

1. Alarm contacts are rated at 0.5A / 125 Vac or Vdc.
2. Terminal block is a compression type, accepting wire sizes #22-14 AWG.
3. Terminals are labeled in non-alarm condition.
4. For a detailed view of the optional Auxiliary Alarm Relay PC Board (A5), refer to drawing (**JE5091**-######) supplied with the unit.
5. For location and arrangement of the optional Auxiliary Alarm Relay PC Board (A5), refer to drawing (**JE508x**-######) supplied with the unit.

1.11. INSTALLING THE TEMP. COMEPNSATION PROBE (OPTIONAL)

The temperature compensation probe contains a temperature-dependent resistor in an epoxy module that you install near your battery. There are three steps in installing the assembly:

1. Mounting the probe assembly near the battery.
2. Installing an interconnection cable from the probe assembly to the AT30.
3. Wiring the charger end of the cable to a terminal block on the main control circuit board.

The actual tempco probe is the same for all battery types and all output voltages of the AT30. The kit part numbers differ depending on cable length ordered. See the tables in Appendix B on page 73 for ordering information. Each kit contains detailed installation instructions (JA5015-00). The main elements of the installation are outlined below.

WARNING:

High voltages appear at several points inside the battery charger. Use extreme caution when working inside the charger. Do not attempt to work inside the charger unless you are a qualified technician or electrician.

Disconnect and lock out all power to the battery charger before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the battery charger. Disconnect the battery from the charger output terminals.

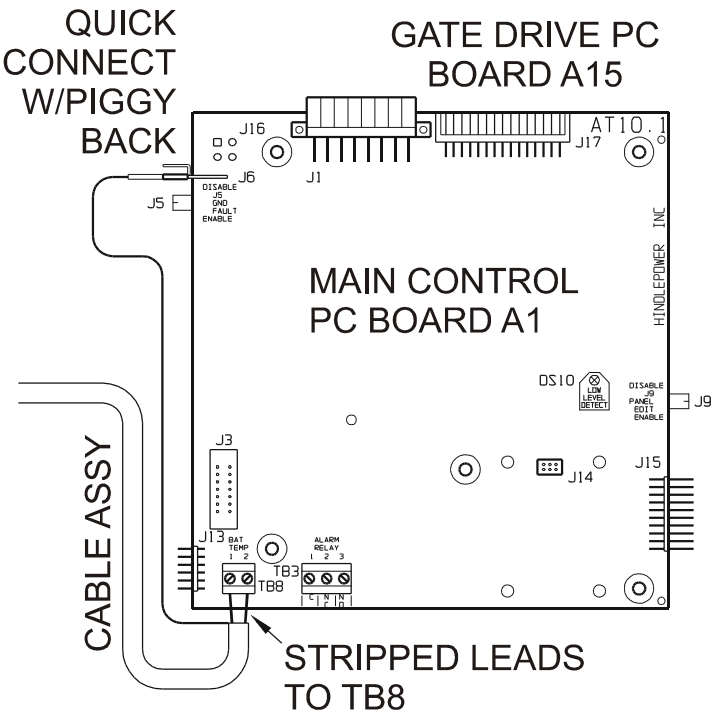
1. De-energize and lock out all ac and dc voltage sources to the AT30. Check with a voltmeter before proceeding.
2. Mount the probe on a clean, dry surface, as close to the battery as possible, such as the battery rack. ***Do not*** mount the probe:
   - on the battery itself
   - on unpainted wood or bare galvanized metal.
   - on plastic surfaces
3. To apply the probe, clean the mounting surface with isopropyl alcohol, and allow to dry thoroughly. Remove the protective backing from the double-faced adhesive tape on the probe, and securely press it onto the surface.
4. Install the cable supplied with the temperature compensation probe kit:
   - Start at the AT30. The end of the cable with two stripped wires and one lead with a quick-connect terminal will be connected inside the enclosure. Leave 30in / 762mm of cable inside the enclosure, and route the other end to the probe at the battery.

- Run the cable though a conduit if possible, but not through a conduit containing any power wiring.
- Route the other end to the probe at the battery and coil up excess cable.

NOTE: If the standard (25ft / 7.6m) cable is not long enough, longer cable assemblies are available in lengths of 50, 100 & 200ft / 15.2, 30.5 & 61.0m. See Appendix B on page 73 for ordering information.

- Be sure your wiring conforms to the NEC and your facility requirements.

5. Attach the interconnection cable to the AT30 as shown in the figure below:
   - Route the cable within the AT10.1 enclosure so that it runs with the wire harness to the back of the front panel, and easily reaches the main control circuit board.
   - At the main control circuit board, insert one of the bare wires from the cable into each terminal of TB8. Polarity is not important.



   - Plug the connector at the end of the nylon-shielded wire of the cable assembly onto J6.
   - Using plastic wire ties, tie the interconnection cable loosely to the existing wire harness. Be especially sure that the cable conforms to the service loop at the hinge end of the door.

6. At the battery, connect the quick-connect terminals to the temperature compensation probe. Polarity is unimportant. Coil up any excess wire and tape or tie it together to prevent damage.

7. Check your work. Be sure that:
   - All connections are secure.
   - The shield is connected to ground *at the charger end only* (on the main circuit board).
   - The cable is connected to TB8 on the circuit board. Other terminal blocks may look similar.
8. Restart the AT30 using the startup procedure in section 2.1. During startup, the AT30 displays **LEAD** on the front panel, indicating that the temperature compensation is set up for lead-acid batteries. While this is being displayed, you can press any front panel key to change the display to read **NICD**, to change the temperature compensation setup for nickel cadmium batteries. The choice you make is saved internally, and will be used again by the AT30 the next time it starts.
9. Adjust the output float and equalize voltages to the battery manufacturer's recommended values, using the AT30's front panel meter, as described in section 2.3.2.

*NOTE: If the temperature compensation probe, or the wiring from the probe to the AT30, is damaged and becomes an open circuit, the AT30 detects the damage and displays **E 08** on the display. The charger then reverts to normal non-temperature-compensated operation until the probe or wiring is repaired. Once the probe is repaired, you must restart the AT30 to activate the probe, as described in section 2.1.*

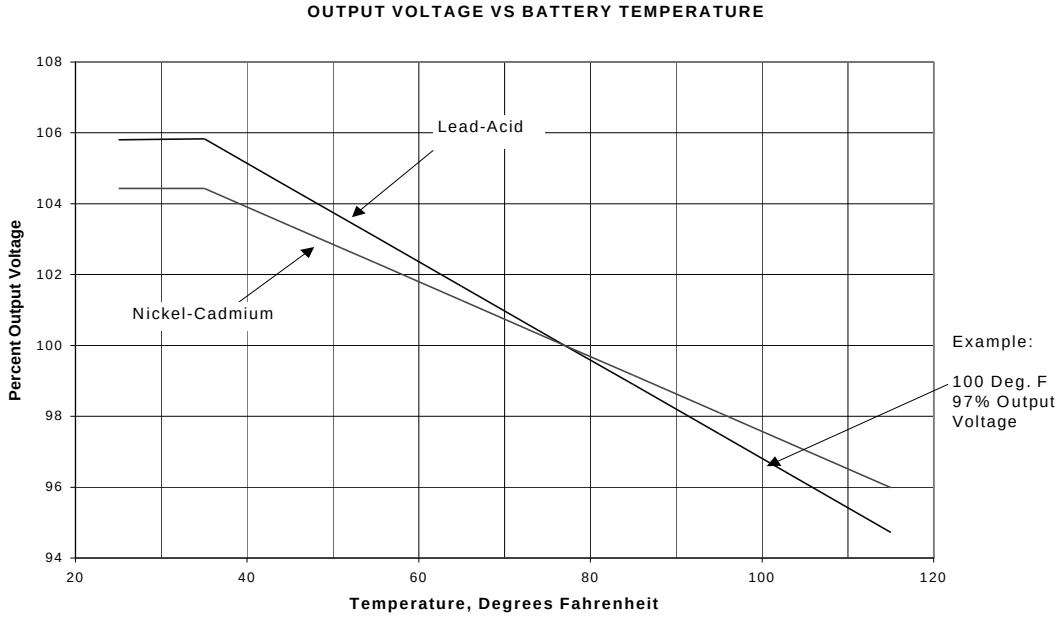
Using temperature compensation

Whenever an electric storage battery is being charged, the terminal voltage of the battery changes a small amount whenever the battery temperature changes. As the battery temperature increases, its terminal voltage decreases. When the battery is being charged with a float type charger, with a constant output voltage, the float current increases when the temperature increases. This results in overcharging the battery, which can result in damage to the materials, or at least the need for more frequent maintenance.

When the AT30 is equipped with a temperature compensation probe, it is able to adjust the output voltage applied to the battery to keep the float current constant, thereby avoiding overcharging. The probe senses the ambient temperature at the battery and adjusts the output float/equalize voltages to compensate for variations in temperature. If the ambient temperature increases, the AT30 output voltage decreases.

Please note the following:

- You should set the Float and Equalize voltages to the values recommended by your battery manufacturer for 77° F (25° C).
- When you enter the Edit mode to adjust the Float or Equalize voltage (see section 2.3.2), the front panel meter shows the 77° F (25° C) value for the Float or Equalize voltage even if the battery is warmer or cooler than 77° F (25° C).
- The actual output voltage of the AT30 may be different from the value shown on the front panel meter, if the battery is warmer or cooler than 77° F (25° C).
- Use a digital meter to measure the actual output voltage of the AT30. If you know the temperature at the temperature compensation probe, you can use the graph below to determine that the output voltage is correct.
- If the battery temperature goes below 32° F (0° C), there will be no further increase in charger output voltage. Likewise, if the battery temperature goes above 122° F (50° C), there is no further decrease in output voltage.



EXAMPLE: Suppose you have a lead-acid battery whose temperature is 100° F / 37.8° C. As shown on the graph, the output voltage should be approximately 97% of the 77° F voltage. If the float voltage is set on the front panel to 132 Vdc, the actual output voltage will be:

132 X 0.97 = 128 Vdc.

2. OPERATING THE AT30 BATTERY CHARGER

2.1. STARTING THE AT30

2.1.1. Understanding the startup sequence

The AT30 is set up at the factory to work with most common batteries and loads without further adjustment. When you start the AT30 for the first time, the factory settings (float voltage, equalize voltage, etc.) control the operation of the charger. You can change the settings after you start the charger. The **FACTORY SETTINGS** are shown in table on page 27.

The AT30 startup routine takes about five seconds. The microprocessor that controls the AT30 initializes the charger by reading the settings that are stored internally. The control circuit then "soft starts" the charger, and the dc output voltage and current increase gradually to the rated value.

2.1.2. Checking the installation

Be sure that you have followed the installation instructions carefully. Check the ac input supply voltage and the battery voltage, and be sure that they match the information on the AT30 nameplate. *Verify that the jumpers on the main transformer T1 are correct for your ac supply voltage.* Open the front panel, and check the battery polarity at the TB1 (+) and (-) terminals.

Using the Digital Meter

When you first start the AT30, the meter display alternates between dc output voltage and dc output current. Each reading is held for two seconds; indicator lights to the left of the display indicate whether the meter is displaying voltage or current.

If you want to “freeze” the meter to display only voltage, press the **METER MODE** key on the front panel. To freeze the meter to display only current, press the key again. Press the key twice more to revert to the alternating display.

2.1.3. Starting the AT30

When you are sure that all connections to the AT30 are properly made, follow these steps to start up the AT30:

- Turn on the front panel dc circuit breaker. The digital meter indicates the battery voltage only. If the meter display does not light, *do not proceed*. Turn off the dc breaker, and check all connections and the battery polarity again. Also check the battery voltage. It must be above 50% of nominal voltage to turn on the display. If you cannot find the problem, refer to the *Troubleshooting Procedure* in section 3.1 on page 46.

CAUTION: If you try to turn on the dc circuit breaker with the battery connected in reverse polarity, the circuit breaker will immediately trip. Do not try to close the dc breaker again, since this may damage the battery charger. Correct the battery polarity before proceeding. If your charger is equipped with dc fuses, one or both fuses will blow when the battery is reversed.

- If you have an optional temperature compensation probe installed, the front panel displays **LEAD** during startup, indicating that the temperature compensation is set up for lead-acid batteries. While this is being displayed, you can press any front panel key to change the display to read **NICD**, to change the temperature compensation setup for nickel cadmium batteries. The choice you make is saved internally, and will be used again by the AT30 then next time it starts.
- Turn on the front panel ac circuit breaker. The digital meter displays the output voltage and current. See *Using the Digital Meter* on page 26. You should hear a soft hum from the AT30 as the output current increases.

  NOTE: If you turn on the ac breaker before the dc breaker, and you have a filtered model of the AT30, there is a possibility that the dc breaker will trip when you try to turn it on. This is caused by the filter capacitors discharging into the battery. To get around this problem, turn off the ac breaker. Restart the AT30 by turning on the dc breaker first.
- The green **FLOAT** indicator lights. Press the **CHRG MODE** key on the front panel. The **FLOAT** indicator goes off, and the yellow **EQLZ** indicator lights. Press the **CHRG MODE** key again to return the charger to the float mode.

The table below shows the normal factory settings for float and equalize voltage, equalize time, current limit setting, and alarm settings. If your purchase order specified other float or equalize voltage settings, a tag attached to the front panel of the AT30 lists the actual voltage settings.

FACTORY SETTINGS FOR ALL PARAMETERS

	Nominal Vdc			
Parameter	**12**	**24**	**48**	**130**
Float Voltage	13	26	52	131
Equalize Voltage	14	28	56	139
HVDC Alarm	14.4	28.8	57.6	144
LVDC Alarm	12	24	48	120
Equalize Time	24 Hours			
Equalize Method	Manual Timer			
Current Limit	110% of nominal output current			
HVDC Shutdown	Disabled			

2.2. USING THE AT30 FRONT PANEL FEATURES

2.2.1. If the meter displays an error message

When you apply power to the AT30 for the first time, the micro-processor control circuit performs a diagnostic check of the system. If it finds anything wrong, it writes an error code to the display, such as **E 01**.

Below is a list of the error codes. See section 3.2 for a full explanation of each error code.

Error Code	Explanation
E 01	Resistor R2 is open or defective.
E 02	Short circuit on output
E 03	HVDC Shutdown has occurred
E 04	Internal memory failure
E 05	Not used
E 06	Failure in Remote Sense wiring
E 07	DC breaker is open, or internal or external output wiring is defective.
E 08	Defective temperature compensation probe
E 09	Misadjusted current limit
E 10	Open internal feedback loop
A 02	Equalize mode is inhibited

2.2.2. Selecting the meter mode

- Press the **METER MODE** key to change the meter display mode. The digital meter has four operating modes:
    1. Alternating between output voltage and output current. When the charger is in a timed equalize mode, the meter alternates between output voltage, output current, and equalize hours remaining.
    2. Displaying output voltage only. The **DC Volts** indicator lights.
    3. Displaying output current only. The **DC Amps** indicator lights.
    4. Displaying equalize hours remaining only. The **EQLZ HRS REMAINING** indicator lights. If the AT30 is not in a timed equalize mode, the meter displays the full programmed equalize time.
- When the charger starts initially, the meter alternates, showing output voltage and output current. The **DC VOLTS** and **DC AMPS** indicators light alternately to indicate what is being displayed.

2.2.3. Selecting the Float or Equalize mode

The AT30 has 2 output voltage settings, Float and Equalize. Use the Float mode for all normal battery charging and to operate your dc system. Use the Equalize mode if it is necessary to balance the level of charge among the cells of the battery. Consult your battery data sheets for information on equalize charging your battery.

- Press the **CHRG MODE** key to change to the equalize mode.

If the equalize method is set to manual timer or auto-equalize timer, the charger will revert to the float mode at the end of the selected equalize time.

- You can press the **CHRG MODE** key again at any time to change back to the float mode.

2.2.4. Choosing the Equalize method

Press the **EQLZ MTHD** key to choose the desired equalize method. The indicator next to the desired equalize method will light. Three equalize methods are available in the AT30:

- Manual Timer
- Manual Equalize
- Auto-Equalize Timer

These equalize methods are described below.

Manual Timer Method

Choose the manual timer method if you perform regularly scheduled equalize charging, or if you base your equalize charging on regular readings of the specific gravity of each cell of your battery (for lead-acid batteries). When your battery requires equalize charging, adjust the manual timer to 1-2 hours for each 100 AH of battery capacity (see section 2.3.3 to learn how to adjust the equalize time). The battery manufacturer can help you determine the best equalizing schedule for your battery.

After you select the manual timer method, press the **CHRG MODE** key to put the charger into the equalize mode. The **EQLZ** indicator will light. When the equalize timer is finished, the charger reverts automatically to the float mode, and the **FLOAT** indicator lights.

At any time during the equalize charge, you can switch the charger back to float mode by pressing the **CHRG MODE** key. The **FLOAT** indicator will light.

If there is an ac power failure during the equalize charge, the AT30 remembers the remaining equalize time. When ac power is restored, it resumes the equalize charge where it left off.

Manual Equalize Method

Choose the manual equalize method when you want to equalize charge the battery, but only when you are able to monitor the battery voltage and gassing rate. After you select the manual equalize method, press the CHRG MODE key to put the charger into the equalize mode. The **EQLZ** indicator will light.

Press the CHRG MODE key again to return the charger to the float mode. The **FLOAT** indicator will light.

NOTE: Never leave the AT30 unattended in the equalize mode with the manual equalize method selected, because a sustained overcharge may cause permanent damage to the battery.

Auto-Equalize Timer Method

Choose the auto-equalize timer method if you have a *flooded* (non-sealed) battery, that is subject to infrequent discharges, or when the battery will be discharged by at least half of its rated capacity during an ac power failure. When ac power is restored to the charger, it turns on in the equalize mode automatically, and the **EQLZ** indicator lights. At the end of the equalize charging time that you select, the charger reverts automatically to the float mode, and the **FLOAT** indicator lights. At any time during the equalize charge, you can switch the charger back to float mode by pressing the CHRG MODE key. The **FLOAT** indicator will light.

Consult your battery manufacturer's instructions before using the auto-equalize timer method with sealed (valve-regulated) lead-acid batteries.

Whenever the ac supply fails for 12 seconds or longer, the auto-equalize timer is enabled. For shorter periods, the timer behaves as shown below:

Mode before ac failure		AC falure duration		Mode after ac failure
FLOAT	→	less than 12 seconds	→	FLOAT
EQUALIZE	→	less than 12 seconds	→	Resume EQUALIZE with time remaining
FLOAT or EQUALIZE	→	12 seconds or greater	→	EQUALIZE with full time

Switching to Equalize Mode with Auto-Equalize Timer Method Selected

You can start an equalize charge at any time.

- Press the CHRG MODE key. The **EQLZ** indicator will light.

When the equalize timer is finished, the charger reverts automatically to the float mode, and the **FLOAT** indicator lights.

2.2.5. Testing the front panel indicators

- Press the DOWN key. This is also the LAMP TEST key.

The meter will display **8888**, and all status & alarm indicators will light.

The LAMP TEST key does not test the **AC ON** indicator. The **AC ON** indicator lights whenever ac power is present, and the ac circuit breaker is turned on. The LAMP TEST key does not operate when ac power is off.

To test the action of the summary alarm relay, press and hold the LAMP TEST key for four seconds. The relay transfers. If you are monitoring the relay with a remote annunciator, it detects the alarm condition.

2.2.6. Testing the Auxiliary Relay Board (optional)

If you have the optional Auxiliary Relay Board installed, you can test the action of the alarm relays. Press and hold the LAMP TEST key for four seconds. The six auxiliary alarm relays on the Auxiliary Relay Board transfer. Remote annunciators connected to these relays will indicate this.

2.2.7. Interpreting the alarm indicators

There are six alarm indicators at the right side of the front panel. An indicator lights for each of the following alarm conditions:

- **HIGH DC VOLTAGE**: lights whenever the dc output voltage exceeds the specified alarm voltage setting. See section 2.3.4 to learn how to adjust the HVDC alarm setting.
- **LOW DC VOLTAGE**: lights whenever the dc output voltage is below the specified alarm voltage setting. See section 2.3.4 to learn how to adjust the LVDC alarm setting.
- **DC OUTPUT FAILURE**: lights whenever the charger cannot provide its full rated output voltage *or* its full rated output current. You cannot adjust this alarm setting.
- **AC INPUT FAILURE**: lights whenever the ac power supply to the charger is interrupted.
- **POS GND**: lights whenever leakage current from the battery positive terminal to ground exceeds a specified threshold.
- **NEG GND**: lights whenever leakage current from the battery negative terminal to ground exceeds a specified threshold.

NOTE: You can adjust the sensitivity of the ground fault detection from 5K to 50k ohms. Adjusting the ground fault sensitivity affects the positive and negative ground fault sensitivities equally.

The indicators light immediately when an alarm occurs. The AT30 also has a summary alarm relay with one form C contact rated 0.5A at 125 Vac/Vdc. If an alarm condition lasts for 30 seconds or longer, the summary alarm relay contact transfers. When the alarm condition is corrected, the relay and all indicators reset automatically.

2.3. SETTING PARAMETERS IN THE AT30

2.3.1. Understanding Parameter Settings

You can change the settings of the AT30 while the charger is operating, using the front panel controls. The changes you make take effect immediately, and are saved internally. If the charger is taken out of service, and then later returned to service, it restarts using the last values you set. You can adjust the following parameters:

- Float voltage
- Equalize voltage
- Equalize timer (in hours)
- High dc voltage alarm setting
- Low dc voltage alarm setting
- Current limit value (in Amperes)
- High dc voltage shutdown feature (on or off)

Your choice of equalize method is also saved internally.

When you want to change any parameter, press the **EDIT/ENTER** key to put the AT30 into *Edit mode*. The meter display flashes about once per second, and the status indicators prompt you to adjust the respective parameter. You adjust each parameter by pressing the **UP** or **DOWN** key until the reading you want shows on the meter display. You can make the display scroll up or down continuously by pressing and holding the **UP** or **DOWN** key.

You cannot exceed certain upper and lower limits for the operating parameters. To see what the limits are for your charger, refer to the AT30 Specifications in Appendix A on page 72.

When you first press the **EDIT/ENTER** key, the AT30 prompts you to adjust the first parameter in the list above (float voltage). When you obtain the value you want on the display, press the **EDIT/ENTER** key again. The AT30 saves the new setting internally, and then prompts you to adjust the second parameter. You continue this way to adjust the first six parameters in the list above. If you want to skip adjusting any parameter, just press the **EDIT/ENTER** key again. The AT30 moves to the next parameter.

When you are finished adjusting the sixth parameter (current limit), press the **EDIT/ENTER** key again. The AT30 saves all adjustments you made internally, and reverts to normal operation. The new settings take effect immediately.

Edit mode ends automatically if you do not press any front panel key within 25 seconds, and any change you made to the last setting is not saved.

2.3.2. Setting the Float and Equalize voltages

- Press the EDIT/ENTER key.

The **FLOAT** and **DC VOLTS** indicators light, and the display flashes the present value of the float voltage. Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the display shows the float voltage you want to set, release the UP or DOWN key. If you go past the voltage you want, press the UP or DOWN key again to reach the voltage you want to set.

- Press the EDIT/ENTER key. The new float voltage setting is saved internally.

The **EQLZ** and **DC VOLTS** indicators light, and the display flashes the present value of the equalize voltage. Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the display shows the equalize voltage you want to set, release the UP or DOWN key. If you go past the voltage you want, press the UP or DOWN key again to reach the voltage you want to set.

- Press the EDIT/ENTER key. The new equalize voltage setting is saved internally.

If you want to adjust the equalize timer duration, skip to section 2.3.3.

OR

If you want to exit the Edit mode now, press the EDIT/ENTER key four more times until the charger returns to normal operation.

Edit mode ends automatically if you do not press any front panel key within 25 seconds, and any change you made to the last setting is not saved.

2.3.3. Setting the Equalize Timer

- Press the **EDIT/ENTER** key until the **EQLZ HRS REMAINING, MANUAL TIMER** and **AUTO EQLZ TIMER** indicators light, and the display flashes the present value of the equalize timer duration in hours.

Press and release the **UP** or **DOWN** key to increase or decrease the value in the display by one count, or press and hold the **UP** or **DOWN** key to scroll the value in the display upward or downward. When the display shows the equalize time, in hours, that you want to set, release the **UP** or **DOWN** key. If you go past the number of hours you want, press the **UP** or **DOWN** key again to reach the number you want to set.

If you set the equalize time to zero hours, the equalize mode is disabled.

- Press the **EDIT/ENTER** key. The new equalize timer duration is saved internally. The same timer setting works for both the manual timer and the auto-equalize timer.

If you want to adjust the alarm settings, skip to section 2.3.4.

OR

If you want to exit the Edit mode now, press the **EDIT/ENTER** key three more times until the charger returns to normal operation.

2.3.4. Setting the Alarms

After you save the equalize timer setting, the Edit mode automatically prompts you to adjust the high dc voltage and low dc voltage alarms. There is a red indicator on the front panel of the AT30 for each of the following alarm conditions:

- High DC Voltage
- Low DC Voltage
- DC Output Failure
- AC Input Failure
- Ground Fault Detection (+)
- Ground Fault Detection (-)

The indicators light immediately when an alarm occurs. The AT30 also has a summary alarm relay with one form C contact rated 0.5A at 125 Vac/Vdc. If an alarm condition lasts for 30 seconds or longer, the summary alarm relay contact transfers. When the alarm condition is corrected, the relay and all indicators reset automatically. The relay contact also transfers if the AT30 detects certain errors, and displays **E 03**, **E 06, E 07** or **E 10** on the front panel meter.

Setting the High DC Voltage Alarm

- Press the EDIT/ENTER key until the **HIGH DC VOLTAGE** indicator flashes, and the display flashes the present value of the high dc voltage alarm.

Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the display shows the high dc voltage alarm point that you want to set, release the UP or DOWN key. If you go past the voltage you want, press the UP or DOWN key again to reach the voltage you want to set.

- Press the EDIT/ENTER key. The new high dc voltage alarm setting is entered into permanent memory.

Setting the low DC Voltage Alarm

- Press the EDIT/ENTER key until the **LOW DC VOLTAGE** indicator flashes, and the display flashes the present value of the low dc voltage alarm.

Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the display shows the low dc voltage alarm point that you want to set, release the UP or DOWN key. If you go past the voltage you want, press the UP or DOWN key again to reach the voltage you want to set.

- Press the EDIT/ENTER key. The new low dc voltage alarm setting is entered into permanent memory.

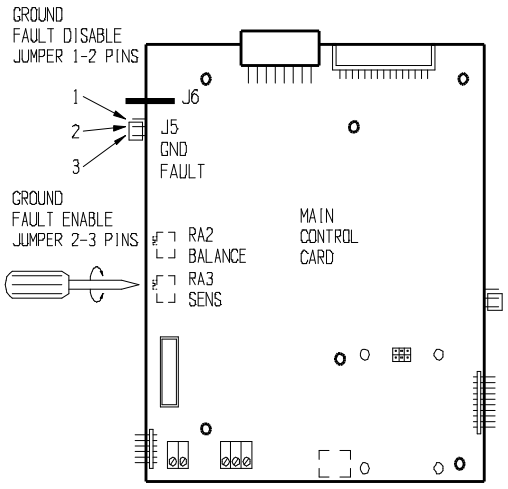
If you want to adjust the current limit setting, skip to section 2.3.5.

OR

If you want to exit the Edit mode now, press the EDIT/ENTER key again to return the charger to normal operation.

Adjusting Ground Detection Sensitivity

You can adjust the sensitivity of the ground detection alarm circuit. You must have a test resistor whose value is the sensitivity you want. You can adjust the sensitivity from 5 to 50 kΩ.



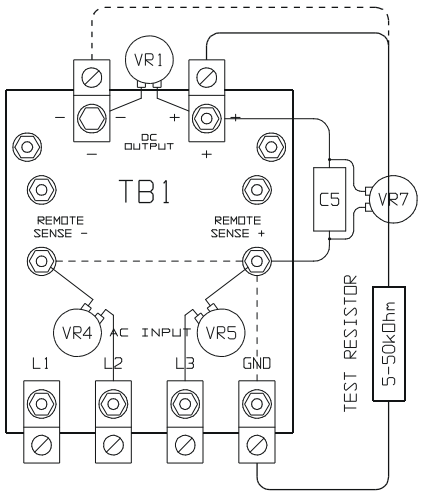
The potentiometer for adjusting ground detection circuit sensitivity is located on the main control circuit board. It is the lower of the two potentiometers labeled **RA3 SENS**, as shown in the figure at the right.

*NOTE: Do not try to adjust the upper potentiometer labeled **RA2 BALANCE**. This adjustment is made at the factory for proper circuit operation.*

CAUTION: Before connecting or disconnecting a test resistor, de-energize and lock out all ac and dc voltage sources to the AT30. Check with a voltmeter before proceeding. Restart the AT30 only when necessary to make the sensitivity adjustment. If your battery is grounded, do not attempt this procedure.

Remove the safety cover. Connect the test resistor between **TB1(+)** and the ground terminal. For I/O Panel layout, refer to the custom Internal Component Layout Drawing (**JE508x**-#######) supplied with the unit.

Adjust **RA3** counterclockwise until the front panel indicator goes out, and adjust slowly clockwise until the **POS GND** indicator just lights.



Make this adjustment slowly, for the indicator is updated once every four seconds. De-energize and lock out power to the AT30. Remove the test resistor and verify that the indicator goes out.

Connect the test resistor between **TB1(-)** and chassis ground Verify that the **NEG GND** indicator lights. If not, adjust **RA3** clockwise until it does. Remove the test resistor.

Disabling the Ground Detection Alarm

You can disable the ground detection alarm circuit, and isolate the circuit from chassis ground. If your battery is normally grounded, or you want to defeat the alarm for any other reason, follow these steps:

- De-energize and lock out all ac and dc voltage sources to the AT30. Check with a voltmeter before proceeding. This includes remote sense wires if they were installed.
- Open the AT30 front panel, and locate jumper **J5** at the top left of the Control Circuit Board (shown on the previous page). Move the jumper to the **DISABLE** position. The **POS GND** and **NEG GND** indicators and the summary alarm relay will not respond to a ground fault.

Restart the AT30, following the instructions in section 2.1.

2.3.5. Setting the current limit value

The AT30 automatically limits its dc output current in case of overload or battery discharge. You can adjust the value of the current limit from 50% to 110% of rated current. The factory setting is 110%.

The current limit adjustment is the last step in the normal Edit sequence. If the AT30 is not in the Edit mode, press the EDIT/ENTER key five times, until the meter display flashes the value of current limit, *in Amperes*. Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the display shows the current limit value that you want to set, release the UP or DOWN key. If you go past the number you want, press the UP or DOWN key again to reach the number you want to set.

- Press the EDIT/ENTER key. The new current limit setting is saved internally.

Edit mode ends automatically if you do not press any front panel key within 25 seconds, and any change you made to the last setting is not saved.

2.3.6. Enabling the High DC Voltage shutdown feature

The AT30 has a built-in high dc voltage shutdown feature. In case of any maladjustment or internal failure that results in a continuous output voltage that is too high, the AT30 shuts down after 30 seconds to protect the battery. The digital display shows **E 03,** and the summary alarm relay contact transfers.

The AT30 is shipped with the high dc voltage shutdown feature disabled.

You can adjust the high dc voltage shutdown (the setting is the same as the high dc voltage alarm setting). Refer to section 2.3.4.

The charger must be in normal operation (not the Edit mode) to enable the high dc voltage shutdown.

To enable the shutdown feature:

- Press and hold the UP key, then
- Press the CHRG MODE key.

The **HIGH DC VOLTAGE** indicator lights, and the display flashes **ON**. You can toggle the shutdown feature **OFF** and **ON** by pressing the CHRG MODE key repeatedly.

If you do not press any key within 4 seconds, the last state indicated (**ON** or **OFF**) is saved internally. Note that you ***do not*** use the EDIT/ENTER key for this feature.

If the AT30 shuts down because of a high dc voltage, the meter display shows error code **E 03**. Reset the charger by turning the ac breaker off, then on again.

Parallel Operation

If two (or more) AT30 chargers are connected in parallel, both sense the output voltage. If one charger runs away, it will supply all the output current; the other has zero output current. The high dc voltage shutdown does not operate in a charger with zero output current, so that only the defective charger (of two or more in parallel) shuts down. The other charger continues to supply the load normally.

2.3.7. Adjusting the Voltmeter Accuracy

The AT30 voltmeter is adjusted at the factory to display the actual output voltage within ±1%. If you replace any component that affects meter accuracy, such as the main control PC board or **R4**, you should readjust the meter. This adjustment procedure is different from all others, because the meter reading remains constant, while the output voltage of the charger changes. Do this adjustment with a fully charged battery and with no load connected.

First, use the *Edit* procedure to adjust the float voltage to the desired value. See section 2.3.2 for instructions on setting the float voltage. Second, press and hold the UP key, then press the EQLZ MTHD key.

The **DC VOLTS** METER MODE indicator will light, and the meter display flashes the output voltage reading. Measure the output voltage of the AT30 using a dc meter accurate to ±0.25% or better.

While watching the meter connected to the AT30 output (not the front panel meter), press the UP or DOWN key until the actual output voltage matches the float setting on the front panel meter.

Each time you press UP or DOWN, you change the AT30 output voltage by a small amount. Continue to press UP or DOWN until the actual output voltage agrees with the front panel reading within ±1%

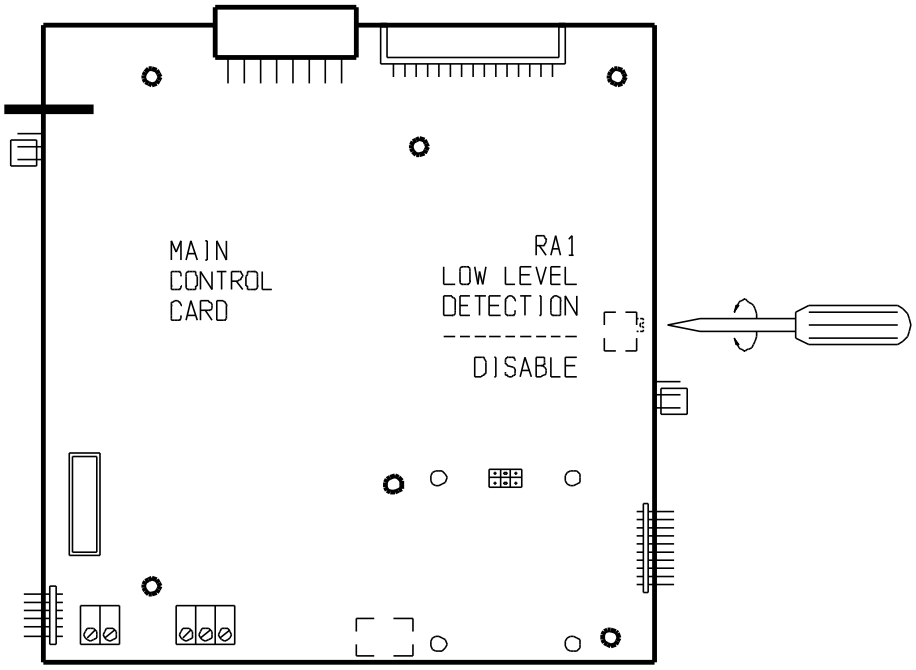
NOTE: Allow one or two seconds for the output voltage to stabilize each time you press the UP or DOWN key.

When you are finished adjusting the output voltage, the AT30 waits 5 seconds, then the display returns to normal operation.

2.3.8. Using the Low Level Detector (LLD)

The AT30 charger is equipped with a summary alarm safety override circuit. This safety feature forces the summary alarm (common alarm) relay contact to transfer, sending an alarm, even if there is a catastrophic failure of the control circuitry. A low battery voltage triggers the safety circuit.

If you have a dc power supply, you can adjust the battery voltage that triggers the alarm. On the back of the main control circuit board, find the potentiometer **RA1**, as shown in the figure below.



Disconnect all ac and dc power sources from the AT30, and connect your dc power supply to the output terminals (positive of the supply to the positive output of the charger). Adjust the power supply to the voltage that you want to activate the alarm.

NOTE: You need at least 50% of the nominal output voltage to power the circuit board.

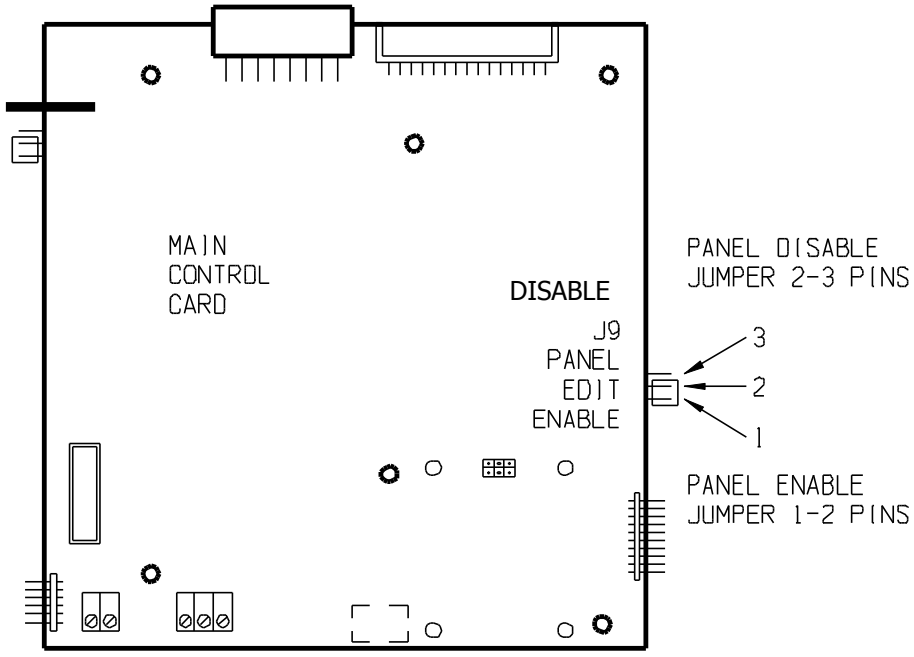
Adjust **RA1** until the alarm just activates. There is a red LED indicator next to **RA1** that indicates when the alarm is active.

2.3.9. Using the front panel security feature

The AT30 charger is shipped with all the front panel keys enabled. You can disable these front panel functions:

- Selecting Equalize method
- Changing settings using the **EDIT/ENTER** key
- Toggling the high dc voltage shutdown feature

Open the front panel, and locate the small plastic jumper **J9** on the right side of the main control board, as shown in the figure below.



Move the jumper to the **DISABLE** position. Now, only the front panel **METER MODE** and **CHRG MODE** keys work. All indicators still work normally.

2.4. Performing routine maintenance

WARNING:

High voltages appear at several points inside the battery charger. Use extreme caution when working inside the charger. Do not attempt to work inside the charger unless you are a qualified technician or electrician.

Disconnect and lock out all power to the battery charger before starting any maintenance procedures. Turn the ac power off at the distribution panel upstream from the battery charger. Disconnect the battery from the charger output terminals.

2.4.1. Keep it clean

The AT30 charger is cooled by natural convection. At least once a year, vacuum the vents at the top and bottom of the enclosure to ensure that there is an adequate supply of cooling air. If you have an extremely dusty environment (especially if airborne dust is conductive), *carefully* vacuum out the interior. Be sure to clean surfaces of circuit boards, and around electrical terminals.

The AT30 is rated for operation up to 122° F / 50° C. If your charger is in a warmer environment, or at an elevation over 3000ft / 914m, contact your sales representative for operating information.

2.4.2. Check power and signal connections

Check the tightness of all field connections inside the charger, and connections to the battery. A loose or corroded connection at the battery terminals can be a fire or explosion hazard, and may cause erroneous operation of the AT30 charger.

2.4.3. Check remote sense wiring (optional)

If you wired the AT30 charger for remote sense, check the signal connections to the battery or load, and check the wiring to be sure the insulation is in good condition. If there is a failure of the remote sense signal wiring, the AT30 charger displays the error code **E 06**, and goes back to local control, sensing the output voltage at the charger output terminals.

2.4.4. Check temperature compensation probe (optional)

If you are using the optional temperature compensation probe, be sure that the probe is securely installed. Be sure the connectors and the wiring from the probe to the AT30 charger are in good condition.

If there is a failure of the temperature compensation probe, or the wiring, the AT30 charger displays the error code **E 08**.

2.4.5. Measuring the output ripple voltage (filtered models only)

If your AT30 charger is a filtered model, at least once a year measure the ac ripple voltage at the battery terminals. Use an rms responding ac voltmeter.[1] The ripple voltage should be no higher than shown in the specifications in Appendix A on page 72, if the battery ampere-hour capacity is at least 4 times the output current rating of the charger.

If you suspect that the output ripple voltage is too high, see "Output ripple voltage too high" of the *Troubleshooting Chart* in section 3.4, page 55.

2.4.6. Viewing the voltage and alarm settings

You can review the parameter settings in the AT30 charger by pressing the **EDIT/ENTER** key on the front panel. Each time you press the key, a different parameter displays, in the following order:

- Float voltage
- Equalize voltage
- Equalize time (in hours)
- High dc voltage alarm setting
- Low dc voltage alarm setting
- Current limit, in Amperes

[1] Don't use a dc voltmeter. The ripple voltage on a battery is a very small ac voltage.

SAMPLE PREVENTIVE MAINTENANCE PROCEDURE

AT30 BATTERY CHARGER

Suggested frequency: every 6 months

Maintenance date _____ Performed by _____

Step (standard features)	Instructions	Results
Clean battery charger	• All vents clean and open. • Remove dust and debris from inside of unit.	☐ OK ☐ OK
Check all electrical connections and wiring	• TB1 connections all tight. • Internal wiring connections tight, slip-on connectors fully seated. Wire and lug insulation in good condition. • Terminations at battery or bus are tight and corrosion free.	☐ OK ☐ OK ☐ OK
Check ac input voltage	• Measure between TB1-L1, TB1-L2 & TB1-L3 using an ac voltmeter. The voltage must be within +10%, -12% of nominal.	Input_____ Vac
Check dc output voltage	• Measure at TB1 (+) and (-) using a dc voltmeter. The voltage should agree with the front panel voltmeter within 1%, and must be correct values for your battery. If the AT30 is using a temperature compensation probe, see the graph on page 25 to determine the correct battery voltage. You need to know the battery temperature for this step.	Float_____ Vdc Equal._____ Vdc
Check ripple voltage	• Measure at battery terminals using ac voltmeter set to millivolts scale. Check against specification in Appendix A on page 72.	Ripple_____ mVac
Test font panel indicators	• Press **LAMP TEST** key on front panel.	☐ OK
Test common alarm relay	• Press **LAMP TEST** key and hold for 4 seconds. Common alarm relay will transfer.	☐ OK

Exercise front panel controls	• Switch from float to equalize, then back to float. • Turn off the dc circuit breaker. **E 07** should appear on display (requires at least 5% of rated output current). Reset breaker.	☐ OK ☐ OK
	• Cycle through meter modes.	☐ **VOLTS** OK ☐ **AMPS** OK ☐ **HOURS** OK
	• Cycle through equalize methods.	☐ **MANUAL TIMER** OK ☐ **MANUAL EQLZ** OK ☐ **AUTO EQLZ TIMER** OK
	• Turn off ac circuit breaker. The **AC INPUT FAILURE** indicator should light. Reset breaker.	☐ Alarm OK
Check voltage and alarm settings	• Use **EDIT/ENTER** key to scroll through settings.	☐ **FLOAT** OK ☐ **EQUALIZE** OK ☐ **HVDC** alarm OK ☐ **LVDC** alarm OK Current limit _____Adc
Final checks	• Be sure safety cover is in place. • Restore charger to normal operation. • Close latch on front panel. • Close padlock if installed.	☐ OK ☐ OK ☐ OK

Step (optional features)	**Instructions**	**Results**
Test auxiliary alarm relays	• Press **LAMP TEST** key and hold for 4 seconds. Alarm relays will transfer.	☐ OK
Check integrity of remote sense or temperature compensation wiring	• Remote sense wiring. • Temperature compensation wiring. • Temperature compensation probe.	☐ OK ☐ OK ☐ OK

A full-size reprint of this Preventive Maintenance Procedure is available from your sales representative. Ask for form (**JD0064-00**).

3. SERVICING THE AT30

3.1. A STEP-BY-STEP TROUBLESHOOTING PROCEDURE

The AT30 battery charger is fully tested and calibrated at the factory and should work for years with a minimum of attention. If you do encounter trouble, there are three steps you should take to find the problem and return the charger to service.

1. Check the front panel meter for an error code. The AT30 is able to diagnose common problems with the battery charger, or with the application or installation. If the front panel displays an error code, see section 3.2, *Interpreting Front Panel Error Messages,* for help in interpreting the code and solving the problem.
2. If the charger does not work properly, but there is no front panel error code, turn off the front panel circuit breakers (or disconnect ac and dc power externally). Then turn the dc and ac power back on. This will return the charger to normal operation as long as there is no internal component failure.

   Note: Do this only once. If the charger does not resume normal operation, go to the next step.

3. If the charger still does not work properly, make a list of the symptoms that you observe, then turn to *Using the troubleshooting chart* in section 3.3. The troubleshooting chart relates common trouble symptoms to their causes, and gives the proper procedures for correcting the problem.
4. If the symptom does not appear on the troubleshooting chart, or if the recommended repair does not work, consult your sales or service representative to arrange for on-site or factory service.

3.2. INTERPRETING FRONT PANEL ERROR MESSAGES

If the AT30 control circuit detects a hardware or wiring problem, it may display an error code on the front panel. To solve the problem, use the table starting below, which lists the error codes and the procedures to use.

WARNING:

High voltages appear at several points inside the battery charger. Use extreme caution when working inside the charger. Do not attempt to work inside the charger unless you are a qualified technician or electrician.

Disconnect and lock out all power from the battery charger before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the battery charger. Disconnect the battery from the charger output terminals.

Error Code	Meaning	Repair Procedure
E 01	Resistor R2 open or defective	A current resistor (R2) is installed at the back of the front panel in the Gate Drive circuit board (A15) input connector (J25). R2 is measured by the control circuit on startup, and is used to determine some of the AT30 charger's parameters, such as the float voltage. If the AT30 finds that R2 is defective, it must be replaced. See section 3.6 for parts ordering information. When you have completed the repair, restart the charger according to section 2.1.
E 02	Short circuit on output	You may get this error code if the battery is discharged to less than 6 volts. When the battery charges to greater than 6 volts, the error code disappears. If you have a seriously discharged battery, allow the charger to run for 24 hours and check the battery voltage again. If it has not increased to the normal voltage rating, consult the battery manufacturer for help. If the battery voltage is normal, then check the wiring at the dc output terminals for a short circuit. If the battery voltage is normal and all external wiring is OK, check the dc breaker on the charger. If it is tripped, try once to reset it. If it trips again immediately, there may be an internal short circuit in the charger. Check the internal wiring. If the charger is filtered, check the dc filter capacitors and the polarity diode. The AT30 normally recovers automatically from an **E 02** condition. If you have shut down the charger for service, restart it according to section 2.1.
E 03	High DC Voltage Shutdown	To restart the charger, turn the ac breaker off, then on. Check the Equalize voltage and High DC Voltage alarm settings. The alarm setting must be higher than the Equalize voltage setting. If you get another High DC Voltage shutdown after a few minutes of operation, there may be an internal component failure. See ***Charger output not controllable*** of the troubleshooting chart on page 54 of section 3.4.

Error Code	Meaning	Repair Procedure
E 04	Internal memory failure	Any parameters that you set, such as Float or Equalize voltage, are saved internally. The internal memory is tested on startup. If the memory test fails, **E 04** appears on the front panel display. The error may also appear if the controller was trying to write to the memory while a power failure occured. If an **E 04** appears, try restarting the AT30 by turning the ac and dc breakers off, then on. If the charger restarts normally, you must reenter any changes you made to the factory settings (float voltage, etc.). If **E 04** appears repeatedly, the internal memory has been damaged. You must replace the control circuit board. See section 3.6 for parts ordering information.
E 05	Not used	This error code was formerly used to indicate a reverse battery connection. It is not available in the AT30.
E 06	R4 or R14 is defective, or remote sense wiring failed	Locate R4 and R14 on the Gate Drive circuit board (A15), mounted on the back of the front panel. Remove the wire harness plugs from J25 & J26, and remove A15 from the main control board (A1). Use an Ohmmeter to measure the values of R4 and R14 (see table 3-1 for the correct value). If either resistor is not within 1% of the specified value, the entire Gate Drive circuit board (A15) must be replaced. If you are using remote sense wiring from the battery to the AT30, the wiring may have failed. The usual failure is an open circuit; a short circuit will usually be indicated by smoke or fire in the wiring. The AT30 charger displays the error code if it detects this wiring failure. You should respond to this problem quickly to be sure that the AT30 regulates the output voltage properly. Wire an annunciator (e.g. buzzer) to the summary alarm relay (TB3) to get a remote indication of any charger problem, or monitor the charger operation using the optional DNP-3/MODBUS communications board. If you have a failure in remote sense wiring, the AT30 regulates its output voltage locally until you correct the problem, see sections 1.9. The locally controlled voltage may not reflect the true requirements of the battery. When you complete the repair, restart the charger as described in section 2.1.
E 07	DC breaker open, or internal failure	If the dc breaker is open, open the ac breaker, then reclose the dc and ac breakers. If the dc breaker trips again, see the troubleshooting chart in section 3.4. If the dc breaker is closed, but you have an **E 07** display, check your battery. If the battery is disconnected, and you then disconnect the load, the charger may display an **E 07** code. Restart the charger according to section 2.1. If the battery and load are OK, see the troubleshooting chart in chart in section 3.4 for help in locating the problem.

Error Code	Meaning	Repair Procedure
E 08	Defective temperature compensation probe	If a temperature compensation probe is connected to the AT30, the control circuit detects the probe on startup, and uses the temperature measured by the probe to control the output voltage of the charger. To understand temperature compensation, see section 1.11. If the temperature compensation probe, or the wiring that connects it to the AT30, fails during normal operation, the AT30 detects the failure, and shows **E 08** on the front panel meter. Disconnect the wiring from the probe, and measure the resistance of the probe with an Ohmmeter. The resistance should be approximately 10,000 Ohms at normal room temperature (77° F / 25° C). If the probe reads open or shorted, it needs to be replaced. If the probe checks good, examine the wiring between the probe and the AT30. Also check the connection of the cable to the control circuit board on the back of the front panel. If the wiring is OK, then the probe needs to be replaced. Once you have replaced the probe, you must restart the AT30 to activate temperature compensation.
E 09	Misadjusted current limit	The output current limit is set at the factory to 110% of the rated output current (e.g. for a 50 Adc charger, the current limit is set to 55 Adc). You can adjust the current limit downward to as low as 50% of the output current, if you have special requirements such as limited ac power available. You should do this only if the normal dc load on the system is smaller than the current limit. If the load current becomes larger than the current limit setting, the battery will not charge properly. The charger displays **E 09**. You should increase the current limit setting to supply the current required by the load. *NOTE: The common alarm relay is not set for this condition.*
E 10	Open internal feedback loop	A redundant internal feedback loop (control loop) is provided as redundancy, to increase reliability when remote sensing is used. If there should be a problem with the internal loop wiring, the charger displays **E 10**. Check the internal wiring in the signal harness, especially wire # **50**. Also check the harness connector (J25) on the Gate Drive circuit board (A15).
A 02	Equalize mode inhibited	If you set the equalize timer to **zero** hours, the equalize mode is inhibited. When you try to put the charger into equalize mode with a front panel control, the display shows the message **A 02**. If you want to enable the equalize mode, set the equalize timer to 1 or more hours.

3.3. USING THE TROUBLESHOOTING CHART

WARNING:

High voltages appear at several points inside the battery charger. Use extreme caution when working inside the charger. Do not attempt to work inside the charger unless you are a qualified technician or electrician.

Disconnect and lock out all power from the battery charger before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the battery charger. Disconnect the battery from the charger output terminals.

Before you try to use the troubleshooting chart, be sure that you have followed the steps in section 3.1.

The troubleshooting chart that begins on the next page is divided into three columns. To use the chart:

1. Make a list of the charger's condition, including the trouble symptoms.
2. Find the symptom(s) in the first column of the chart.
3. The middle column contains common causes for the problem you observe, in order of probability.
4. Follow the action described in the right-hand column to correct the problem and return the charger to normal service.

Determining the condition of the charger:

- Is the front panel **AC ON** indicator lit?
- What is the ac voltage at the input terminals (measured with an ac voltmeter)?
- What is the dc voltage at the output terminals (measured with a dc voltmeter)?
- Does the meter on the front panel display any voltage or current?
- Are any alarm indicators lit?
- Do the front panel status indicators work (Charge Mode, for example)?
- Can you change the charger to the Equalize mode and back to Float?
- Is the charger making any noise? Is it unusually loud?
- Is there any sign or smell of smoking or burning?

For instructions on replacing components, see section 3.5 on page 60. For information on identifying internal components, refer to the custom Record Drawing Package supplied with the unit and described in Appendix C on page 74.

3.4. TROUBLESHOOTING CHART

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
AC breaker trips (or fuses clear) immediately	1. Shorted rectifier diode or SCR	1. Test by disconnecting wires # **7**, **8** & **9** at the rectifier module(s) (A16) mounted on the main heat sink(s), or at the main transformer (T1). Measure resistance between the ac terminals (bottom terminals) on the rectifier module(s). It should be at least 100,000 Ohms (check both polarities). If resistance is low in either direction, replace the rectifier module(s) (A16) as needed.
	2. Defective wiring to T1 or to rectifier bridge	2. Check spacing of terminals and check wiring for signs of insulation damage, burns, etc. Repair as necessary.
	3. Defective transformer T1	3. Test by disconnecting wires # **7**, **8** & **9** from the transformer secondary taps (T1-X1, X2 and X3). If ac breaker still trips, test by disconnecting wires # **42**, **43**, **44**, **45**, **35** and **36** from the tertiary taps (T1-Y0, Y1, Y2, Y3, W1 and W2). If ac breaker still trips, replace the transformer (T1).
AC breaker trips (or fuses clear) after a few minutes	1. Loose connection to breaker/fuse	1. Check and tighten connections as required.
	2. Wrong ac voltage, or T1 taps miswired	2. Be sure the transformer primary taps (T1-H1, H2 and H3) are wired correctly for your input voltage. See section 1.6 for details.
	3. Open SCR	3. Use a clamp-on ammeter to measure the current in wires # **7**, **8** & **9**, between T1 and the rectifier modules. If it less than 50% of the dc output current, one of the six (6) SCRs or diodes is defective. Replace the rectifier module(s) (A16).
	4. SCR not controllable	4. Disconnect the wire harness plug from connector J26 on the top of the Gate Drive board (A15) and restart the charger. If you are able to measure output current, one of the SCRs is defective. Test and replace the rectifier module(s) (A16) as needed.
DC breaker trips (or fuses clear) immediately	1. Battery connected with reverse polarity	1. Check and correct battery wiring if necessary.
	2. Defective rectifier bridge (if unfiltered charger)	2. Test by disconnecting wires # **7**, **8** & **9** at the rectifier module(s) (A16) mounted on the main heat sink(s), or at the main transformer (T1). Measure resistance between the ac terminals (bottom terminals) on the rectifier module(s). It should be at least 100,000 Ohms (check both polarities). If resistance is low in either direction, replace the rectifier module(s) (A16) as needed.
	3. Defective Free-Wheeling diode CR4	3. Disconnect wire # **15** from SCR module mounted on the heat sink assembly or from the positive bus bar. Measure the resistance through the Free-Wheeling diode (CR4). Check both polarities; it should be at least 100,000 Ohms in one polarity, and less than 1,000 Ohms in the other polarity. Replace CR4 if it is defective.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
	4. Defective Polarity Diode CR1 (if filter assembly is installed)	4. Disconnect wire # **17** from the dc circuit breaker (CB2), or the optional dc fuse (F3). Measure the resistance through the Polarity Diode (CR1), mounted to the **negative** filter capacitor bus bar. Check both polarities. It should be at least 100,000 Ohms in one polarity, and less than 1,000 Ohms in the other polarity. Replace CR1 if it is defective.
	5. Defective wiring	5. Check spacing of terminals and check wiring for signs of insulation damage, burns, etc. Repair as necessary.
DC breaker trips (or fuses clear) after a few minutes	1. Loose connection to breaker	1. Check and tighten connections as required.
	2. Open SCR	2. Use a clamp-on ammeter to measure the current in wires # **7**, **8** & **9**, between T1 and the rectifier modules. If it less than 50% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module(s) (A16).
	3. SCR not controllable	3. Disconnect the wire harness plug from connector J26 on the top of the Gate Drive board (A15) and restart the charger. If you are able to measure output current, one of the SCRs is defective. Replace the rectifier module(s) (A16) as needed.
	4. Defective Gate Drive circuit board A15	4. If the front panel meter shows more than 110% of rated dc current, the Gate Drive board (A15) may be defective. Unplug A15 from the Main Control board (A1). If the output current **DOES NOT** drop to zero, replace the Gate Drive board (A15).
	5. Defective Main Control board A1	5. If the front panel meter shows more than 110% of rated dc current, the Main Control board (A1) may be defective. Unplug the system harness connectors (J25 and J26) from the Gate Drive board (A15). If the output current drops to zero, replace the Main Control board (A1).
No output current, and **AC ON** lamp is out, but ac and dc breakers are on	1. AC supply failure	1. If the **AC ON** indicator is out, check the feeder circuit breaker or fuse.
	2. Input fuse F1A/B/C blown	2. Remove the ac fuses (F1A, F1B and F1C) from the fuse holder(s) and check if blown with an Ohmmeter or fuse tester. Replace F1A, F1B, and/or F1C as needed. NOTE: If the replacement fuses immediately blow, see the sections titled "AC breaker trips immediately" and "AC breaker trips after a few minutes" for further troubleshooting hints.
	3. Defective wiring	3. Check terminals and wiring between T1 and the rectifier bridge assembly, main inductor (L1), dc filtering assembly (if present), dc breaker (CB2), optional dc fuses (F3/F4), and the output terminals (TB1+/-). Check wires # **42** through # **45** from T1-Y0 through T1-Y3 to the Gate Drive circuit board (A15) connector (J25). Repair as necessary.
	4. Defective transformer T1	4. Use an ac voltmeter to measure the ac voltage from T1-X1 to T1-X2 and T1-X3. It is normally 50% to 80% higher than the rated dc output voltage. If it is too low, check the wiring of the transformer primary taps (T1-H1 through T1-H3). See section 1.6 for details. If the ac primary voltage is **zero**, replace the T1.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
No output current, but **AC ON** lamp is on, and ac and dc breakers are on	1. Battery is fully charged	1. This is normal operation in a system with little or no dc load. As long as the charger maintains Float voltage, it is operating normally.
	2. Float or Equalize voltage set too low	2. Check the Float and Equalize voltages and adjust them if necessary. Consult your battery manufacturer for the proper voltage settings.
	3. Wrong ac input voltage, or miswired T1 taps	3. Be sure the transformer primary taps (T1-H1, H2 and H3) are wired correctly for your input voltage. See section 1.6 for details.
	4. Defective wiring	4. Check terminals and wiring between T1 and the rectifier bridge assembly, main inductor (L1), dc filtering assembly (if present), dc breaker (CB2), optional dc fuses (F3/F4), and the output terminals (TB1+/-). Repair as needed.
	5. Defective rectifier bridge	5. Use an ac voltmeter to measure the voltage between the SCR gate leads on each SCR module. If you measure about 1.0V rms, but there is no output current, replace the rectifier module(s) (A16) as needed.
	6. Defective Gate Drive circuit board	6. If you do not measure any ac voltage in step 5 above, and the battery voltage is less than the Float voltage setting, replace the Gate Drive circuit board (A15).
	7. Defective transformer T1	7. Use an ac voltmeter to measure the ac voltage between the transformer secondary taps (T1-X1, T1-X2 & T1-X3). The line-to-line voltage is normally the same as the rated dc output voltage. If it is too low, check the wiring of the transformer primary taps (T1-H1, T1-H2 & T1-H3). See section 1.6 for details. If the ac voltage on the transformer secondary taps is **zero**, replace T1.
	8. Defective inductor L1 or L2	8. Disconnect the wiring from the main inductor (L1) and measure the resistance between the terminals. If it is an open circuit, replace L1. Repeat for inductor (L2) if the optional dc filter is installed.
	9. Defective dc breaker (CB2)	9. Disconnect the battery, and connect a light dc load to the charger. Measure the dc voltage across TB1(+) and TB1(-), with the dc circuit breaker (CB2) on. If no voltage is measured, replace CB2.
Front panel is dead, but ac and dc voltages are present at TB1	1. Control boards are not connected	1. Make sure the Gate Drive board (A15) is firmly connected to the Main Control board (A1) via plugs (J17 to P17). Make sure the two signal harness plugs are firmly inserted into the Gate Drive board (A15) connectors (J25 and J26).
	2. Defective Main Control board A1	2. If the **AC ON** indicator is lit, but the rest of the front panel is dead, replace the Main Control board (A1).
	3. Defective wiring	3. Check the two harness wirings to the Gate Drive board (A15) connectors (J25 and J26) for signs of insulation damage, burns, etc. Confirm all wires are securely crimped in the connector.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Front panel dies during ac power failure and dc voltage is present at TB1	1. Defective power resistor R3	1. Use a dc voltmeter to measure the dc voltage from TB1(-) to J25 pin # **25** on the Gate Drive board (A15). It is normally 12 Vdc when the rated output voltage is at TB1(+) and TB1(-). If it is not, remove all power from the charger, and measure the resistance from TB1(+) to J25 pin # **19** (see the table in section 3.6 for the proper resistance value). If the resistance is not within 10% of the table value, replace R3.
	2. Defective wiring	2. Remove the safety shield, and check the wiring to and from TB1 and the Main Control board (A1) for signs of insulation damage or burns. Repair any damaged wiring.
Charger output voltage too high, not controllable	1. Defective SCR	1. Disconnect the wire harness plug from connector J26 on the top of the Gate Drive board (A15) and restart the charger. If you are able to measure output current, one of the SCRs is defective. Replace the rectifier module(s) (A16) as needed.
	2. R4 or R14 is defective, or wrong value	2. See page 63 of section 3.5. Locate R4 and R14 on the Gate Drive board (A15). Remove one end of each resistor and measure its value with an Ohmmeter. See the table in section 3.6 for resistance values. If either resistor is not within 1% of the specified value, replace R4 and/or R14 as needed.
	3. Defective temperature compensation probe (optional)	3. Remove one of the probe leads from TB8 and measure its resistance. At 77° F / 25° C the resistance should be about 10K Ohms. If it is not, replace the probe assembly (A10).
	4. Defective Main Control board A1	4. If the front panel meter shows more than 110% of rated dc current, the Main Control board (A1) may be defective. Unplug the system harness connectors (J25 & J26) from the Gate Drive board (A15). If the output current drops to zero, replace the Main Control board (A1).
Output voltage does not agree with front panel meter	1. Temperature compensation probe is installed	1. If the optional temperature compensation probe is installed, the output voltage may be different from the selected float or equalize voltage. The difference in the voltages depends on the probe temperature. The front panel meter always displays the selected voltage as if the battery were at 77° F / 25° C.
	2. Circuit board, or another component may have been replaced	2. Recalibrate the voltmeter accuracy as described in section 2.3.7.
	3. R4 or R14 is defective, or wrong value	3. See page 63 of section 3.5. Locate R4 and R14 on the Gate Drive board (A15). Remove one end of each resistor and measure its value with an Ohmmeter. See the table in section 3.6 for resistance values. If either resistor is not within 1% of the specified value, replace R4 and/or R14 as needed.
	4. Defective Main Control board A1	4. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute before returning the dc connection, followed by the ac connection. If the charger still has the wrong output voltage, replace the Main Control board (A1).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Charger never reaches float (or equalize) voltage (within 1%)	1. Current limit set too low	1. If the AT30 is not in the Edit mode, press the **EDIT/ENTER** key five times, until the meter display flashes the current limit value (in Amperes). If the current limit is less than 110%, adjust it to 110% as described. See *Setting the Current Limit Value*, section 2.3.5 for details.
	2. Defective battery or dc load, or load is too great	2. Check each cell of the battery. If one or more cells are shorted, the charger may not be able to reach the Float voltage. You may have the same problem if the normal load current is more than the rated output current of the charger.
	3. Wrong ac input voltage, or voltage too low, or T1 wired incorrectly	3. Be sure the main transformer (T1) primary taps are wired correctly for your input voltage. See *Changing Transformer Taps*, section 1.6. The actual ac input voltage must be at least 88% of the rated value for the charger to produce full output power.
	4. Defective rectifier bridge	4. Use a clamp-on ammeter to measure the current in wires # **7**, **8** & **9**, between T1 and the rectifier modules. If it less than 50% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module(s) (A16) as needed.
	5. Defective Main Control board A1	5. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute before returning the dc connection, followed by the ac connection. If the charger output current is below the current limit value, but it still has the wrong output voltage replace the Main Control board (A1).
Input current too high	1. Wrong ac input voltage, or T1 wired incorrectly	1. Be sure the T1 primary taps are wired correctly for your input voltage. See *Changing Transformer Taps*, section 1.6. The actual ac input voltage must be at least 88% of the rated value for the charger to produce full output power.
	2. Defective rectifier bridge	2. Disconnect the wire harness plug from connector J26 on the top of the Gate Drive board (A15) and restart the charger. If you are able to measure output current, one of the SCRs is defective. Replace the rectifier module(s) (A16) as needed.
	3. Defective T1	3. Test by disconnecting wires # **7**, **8** & **9** from the transformer secondary taps and wires # **42**, **43**, **44**, **45**, **35** and **36** from the tertiary taps. If ac input current is still too high, replace T1.
Output ripple voltage too high	1. Charger is unfiltered	1. Verify by checking the data nameplate against the ordering code on page ii. Order and install the dc filter option if desired.
	2. Battery is disconnected or defective	2. Be sure battery is connected. Inspect battery according to the manufacturer's instructions.
	3. Battery too small for charger rating	3. Check the measured ripple against the specification for your AT30 model on page 72. The ripple rating is for a battery whose Ampere-hours are four (4) times the charger Ampere rating. For a smaller battery, ripple voltage may be higher.
	4. Defective filter capacitors C1 and/or C2	4. Test with capacitance meter and replace as needed.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Charger very noisy	1. Loose hardware or enclosure panel	1. Check and tighten all component mounting hardware and panel hardware.
	2. Defective rectifier bridge	2. Use a clamp-on ammeter to measure the current in wires # **7**, **8** & **9**, between T1 and the rectifier modules. If it less than 50% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module(s) (A16) as needed.
Meter readings are erratic	1. Defective or disconnected battery	1. Turn off the charger. With a light dc load connected to the battery, be sure each cell reads the nominal cell voltage (2.0V for lead-acid / 1.25V for Ni-Cd). Restart the charger. Each cell should now read approximately the nominal Float voltage (2.2V for lead-acid / 1.35V for Ni-Cd).
	2. Defective scaling resistor R4 or R14	2. See page 63 of section 3.5. Locate R4 and R14 on the Gate Drive board (A15). Remove one end of each resistor and measure its value with an Ohmmeter. See the table in section 3.6 for resistance values. If either resistor is not within 1% of the specified value, replace R4 and/or R14 as needed.
	3. Defective Main Control board A1	3. If the output voltage is constant, but the front panel meter is erratic, replace the Main Control board (A1).
Lamp test key does not work, or some lamps do not light	1. No Vac	1. The lamp test key does not work during an ac power failure.
	2. Control circuit board A1 is not secured to front panel	2. Open the front panel, and be sure that the control circuit board is securely mounted on the standoffs on the back of the panel. All indicators should extend about .125in / 3.18mm through the front of the panel.
	3. Defective Main Control board A1	3. When you press the **LAMP TEST** key, if some but not all indicators light, or the digital meter does not display "***8888***", replace the Main Control board (A1).
One or more front panel keys do not work	1. Front panel is locked	1. Open the front panel, and be sure that jumper (J9) on the Main Control board (A1) is in the **ENABLE** position.
	2. Main Control board A1 is not secured to front panel	2. Open the front panel, and be sure that the control circuit board is firmly seated on the standoffs on the back of the panel. Front panel keys must operate freely.
	3. Defective Main Control board A1	3. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute before returning the dc connection, followed by the ac connection. If some of the front panel keys still do not work, replace the Main Control board (A1).
Two chargers connected in parallel, but only one has output current	1. Check for normal operation of both chargers	1. The AT10.1 is not designed to share the load current when two or more chargers are connected in parallel, so it is normal for one of a pair to have no output current. You can check the operation of the "off" charger by increasing its Float voltage until it starts to deliver output current. When you have finished the test, be sure both chargers are set to the same Float and Equalize voltages.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
HIGH DC VOLTAGE indicator is on	1. High DC Voltage alarm and Equalize voltage settings are mismatched	1. Be sure that the High DC Voltage alarm setting is higher than the Equalize voltage setting. See sections 2.3.2 and 2.3.4.
	2. Defective rectifier bridge	2. Disconnect the wire harness plug from connector J26 on the top of the Gate Drive board (A15) and restart the charger. If you are able to measure output current, one of the SCRs is defective. Replace the rectifier module(s) (A16) as needed.
	3. Defective Main Control board A1	3. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute before returning the dc connection, followed by the ac connection. If the charger output voltage is normal, but the **HIGH DC VOLTAGE** indicator is still on, replace the Main Control board (A1).
No alarm, but output voltage is above High DC Voltage setting	1. Output current is below 2%	1. Output current must be greater than 2% of rated current to produce a High DC Voltage alarm. See *Parallel Operation* portion in section 2.3.6.
	2. Defective Main Control board A1	2. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute before returning the dc connection, followed by the ac connection. If the charger output voltage is above the alarm setting, but the **HIGH DC VOLTAGE** indicator still does not light, replace the Main Control board (A1).
LOW DC VOLTAGE indicator is on, but ac and dc breakers are closed; ac input voltage is normal; there is output current	1. Battery is discharged	1. After an ac power failure, or a battery discharge for any other reason, it may take several hours to recharge the battery. It is normal for the **LOW DC VOLTAGE** indicator to be on until the battery voltage is above the Low DC Alarm voltage.
	2. Low DC Voltage alarm and Float voltage settings are mismatched	2. Be sure that the Low DC Voltage alarm setting is lower than the Float voltage setting. See sections 2.3.2 and 2.3.4.
	3. Defective rectifier bridge	3. Use a clamp-on ammeter to measure the current in wires # **7**, **8** & **9**, between T1 and the rectifier modules. If it less than 50% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module(s) (A16) as needed.
	4. Defective Main Control board A1	4. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute before returning the dc connection, followed by the ac connection. If the charger output voltage is normal, but the **LOW DC VOLTAGE** indicator is still on, replace the Main Control board (A1).
	5. Defective dc circuit breaker CB2	5. Disconnect the battery, and connect a light dc load to the charger. Measure the dc voltage across TB1(+) and TB1(-), with the breaker on. If no voltage is measured, replace the dc circuit breaker (CB2).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
DC OUTPUT FAILURE indicator is on, but ac input voltage is normal, and ac & dc breakers are closed	1. Defective rectifier bridge	1. Use a clamp-on ammeter to measure the current in wire #**7**, #**8** and #**9**, between T1 and the rectifier module(s). If it less than 50% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module.
	2. Defective Main Control board A1	2. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute before returning the dc connection, followed by the ac connection. If the charger output voltage and current are normal, but the **DC OUTPUT FAILURE** indicator is still on, replace the Main Control board (A1).
	3. Defective transformer T1	3. Use an ac voltmeter to measure the ac voltage between the transformer secondary taps (T1-X1, T1-X2 & T1-X3). The line-to-line voltage is normally the same as the rated dc output voltage. If it is too low, check the wiring of the transformer primary taps (T1-H1, T1-H2 & T1-H3). See section 1.6 for details. If the ac voltage on the transformer secondary taps is **zero**, replace T1.
	4. Defective dc circuit breaker CB2	4. Disconnect the battery, and connect a light dc load to the charger. Measure the dc voltage across TB1(+) and TB1(-), with the breaker on. If no voltage is measured, replace the dc circuit breaker (CB2).
AC INPUT FAILURE indicator is on	1. AC power failure	1. If the ac input power fails, the front panel **AC ON** indicator goes out, and the **AC INPUT FAILURE** indicator goes on.
	2. Upstream feed breaker/fuse is tripped	2. Be sure the front panel ac circuit breaker (CB1) is closed. Measure the ac voltage at the battery charger input terminals (TB1-L1, TB1-L2 and TB1-L3). If it is zero, check the upstream distribution breakers and fuses.
	3. Defective wiring	3. Measure ac voltage at the transformer primary taps (T1-H1, T1-H2 and T1-H3). It should be the same as the ac supply voltage.
	4. Defective Main Control board A1	4. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute before returning the dc connection, followed by the ac connection. If the **AC ON** indicator is on, but the **AC INPUT FAILURE** indicator is still on, replace the Main Control board (A1).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
POS GND or **NEG GND** indicator is on	1. Ground fault on external dc bus	1. Disconnect the charger from the battery and dc bus, and check the battery and dc bus for a ground fault.
	2. Alarm needs calibration	2. Calibrate the ground detection sensitivity. See section 2.3.4.
	3. Defective wiring	3. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute and disconnect the charger from the battery and dc bus. Turn the charger on and measure the voltage from TB1(+) to chassis, and from TB1(-) to chassis. The voltage readings should be equal, each approximately half of the total output voltage. If there is more than a 10% imbalance, turn off the charger and inspect all wiring from TB1 to the dc circuit breaker (CB2), dc filter inductor (L1) if present, and the rectifier bridge. Look for evidence of insulation damage, insufficient spacing between terminals and chassis, or wires run too close to metal edges.
	4. Defective Main Control board A1	4. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute before returning the dc connection, followed by the ac connection. If you are sure there is no ground fault on the external bus or within the charger, but the **POS GND** or **NEG GND** indicator is still on, replace the Main Control board (A1).
Summary alarm relay is in alarm mode, but no front panel alarm indicator is on	1. Defective Main Control board A1	1. Turn off both front panel circuit breakers (CB1/CB2), or turn off ac and dc power externally if the charger does not have breakers. Wait one minute before returning the dc connection, followed by the ac connection. If the relay remains in alarm mode, check the Low Level Detect indicator on Main Control board (A1). See section 2.3.8. If no other alarm is on, replace the Main Control board (A1).

3.5. REPLACING DEFECTIVE COMPONENTS

WARNING:

High voltages and high temperatures appear at several points inside the battery charger. Use extreme caution when working inside the charger. Do not attempt to work inside the charger unless you are a qualified technician or electrician.

Disconnect and lock out all power from the battery charger before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the battery charger. Disconnect the battery from the charger output terminals.

For information on identifying internal components, refer to the custom Record Drawing Package supplied with the unit and described in Appendix C on page 74.

Removing the safety shield (if present)

AT30 **Style-5018** and **Style-5030** enclosures feature a clear plexiglas safety shield, as a second protective barrier between the user and the internal components. Some of the following repair procedures require you to remove this shield to access internal components.

Open the front door and remove the clip fasteners from the front of the plexiglas shield. Lay or lean the shield near the enclosure. ***Do not lay the shield on the top of the charger.*** The top vents on the enclosure are required for cooling of the unit.

Attach the plexiglas safety shield back onto the enclosure opening using the clip fasteners after replacing components and before starting up the unit.

CAUTION: Hazardous ac and dc voltages are present on the I/O panel terminals and several internal components.

Replacing the control circuit board (A1) and/or gate drive board (A15)

CAUTION: The main control printed circuit board (A1) is sensitive to damage from static discharges. Leave the board in its anti-static bag until you are ready to install it. Ground yourself before handling the board by touching the ground stud on the back of the door. Handle the board only by the edges.

Turn off all power to the charger. Disconnect the battery from the output terminals. Note that the control circuit board and gate drive board are mounted together as a pair. Remove the signal wire harness plug from the upper left edge of the boards. If present, remove the summary alarm contact remote wires from TB3 on the bottom of A1. If the optional temperature compensation probe is installed, remove the main wires from TB8 on the bottom of A1 and remove the shield wire from J6 at the top-left side of A1. Make sure all wires are detached from the two pc boards.

The boards are mounted on ten plastic standoffs. Compress the tab on each standoff, and pull the boards toward you until they clear all the standoffs. Separate the boards, if you are replacing only one, and then reconnect the replacement board. Put the replacement board(s) in place on the front panel with the same orientation, and push them onto the standoffs. Be sure that the boards are fully seated on all ten standoffs. Re-connect the signal wire harness plug to the boards, matching the orientation when removed. If earlier removed, reconnect any wires to TB3, TB8 and J6 on A1. See section 2.1 for the steps to restart the charger.

If your charger parameters (float voltage, etc.) are different from the factory preset values, you should program in the new values now. See section 2.3. You should also recalibrate the dc voltmeter according to section 2.3.7.

Replacing the ac input or dc output circuit breaker (CB1/CB2)

De-energize and lock out all ac and dc voltage sources to the AT30. Check with a voltmeter before proceeding. This includes remote sense wires if they were installed. Open the front panel, and remove the safety shield. Remove the mounting screws for the circuit breaker on the circuit breaker bracket, and carefully remove the circuit breaker from the charger. Remove the wires from the terminals, one at a time, and transfer the wires to the terminals of the replacement breaker. *Be sure the terminal fasteners are tight.* Install the replacement breaker into the bracket, reversing the procedure above, using the original mounting screws.

Replacing the ac surge suppressors (VR2, VR4 or VR5)

Turn off all power to the charger. Disconnect the battery from the output terminals. Remove the safety shield.

For **VR2** (connected to L1), **VR4** (connected to L2) or **VR5** (connected to L3), remove the hardware from the input terminal L***x***, and remove the lugged lead of the ac surge suppressor. Install one lead of the replacement surge suppressor onto the L***x*** terminal. Replace the other wires and the L***x*** terminal hardware. Repeat procedure for the I/O ground stud. Tighten all hardware.

NOTE: The ac surge suppressors are not polarized.

Replacing the dc surge suppressor (VR1)

Turn off all power to the charger. Disconnect the battery from the output terminals. Remove the safety shield.

Remove the hardware from the output terminal TB1(+), and remove the lead of the dc surge suppressor. Install one lead of the replacement surge suppressor. Replace the other wires and the hardware. Repeat for the output terminal TB1(-). Tighten all hardware.

NOTE: The dc surge suppressor is not polarized.

Replacing the dc surge suppressor networks (VR6/C4, VR7/C5)

Replace these networks as assemblies; do not replace individual parts.

Turn off all power to the charger. Disconnect the battery from the output terminals. Remove the safety shield.

To replace the network VR6/C4, remove the hardware from the output terminal TB1(-), and remove the lead of the network. Cut the plastic wire ties holding the assembly tight against the I/O panel. Install one lead of the replacement network. Replace the other wires and the hardware. Repeat for the other lead of the network on the I/O ground stud. For the network VR7/C5, use the above procedure, but start with the lead on TB1(+). Tighten all hardware. Replace cut wire ties if possible.

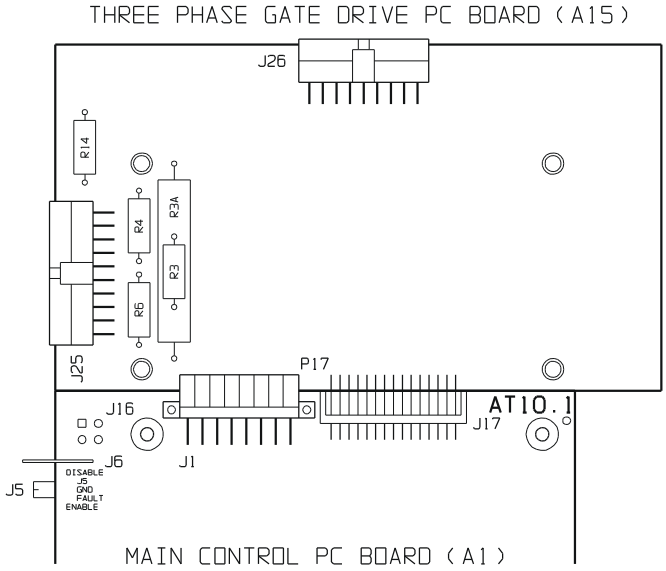
NOTE: The dc surge suppressor networks are not polarized.

Replacing the power (ballast) resistor (R3) - 48 and 130 Vdc units only

For 48 Vdc and 130 Vdc AT10.1 battery chargers rated 30-100 Adc, R3 is mounted with metal brackets onto the back panel of the enclosure. Cut wires # **49** and # **51** connected to R3, as close to the resistor leads as possible. Strip off .25in / 6.4mm of insulation from the cut ends of the wires. Unscrew the top mounting-bracket and remove the existing resistor. Mount the new R3 and replace the top mounting-bracket. Polarity is not important. Carefully re-solder the cut wires to R3.

Replacing resistors (R3, R4, R6 & R14) on the gate drive pc board (A15)

For 12 Vdc and 24 Vdc AT30 battery chargers, R3 is soldered directly onto A15. In all AT30 battery chargers, R4, R6 and R14 are soldered directly onto A15. See detail of the gate drive pc board below for proper location.



If any of these resistors need to be replaced we suggest you order a new A15 board. See *Replacing the control pc board (A1) and/or gate drive pc board (A15)* on page 61.

If any of these resistors *must* be replaced without replacing A15, please select the proper part number listed in the table starting on page 64 and order it from the factory or your sales representative.

Remove A15 as described on page 61. Using wire cutters, clip the soldered leads of the old resistor and remove it from A15. Carefully solder on the new resistor, making sure not to damage any other components on A15. Polarity is not important for these resistors. Once the solder cools, replace A15 as described on page 61.

3.6. ORDERING REPLACEMENT PARTS

To order replacement parts, please provide the following information for each component:

- Circuit symbol from the Parts Data Package report and/or custom AT30 Schematic (**JE5092**-######) supplied with the unit.
- Factory part number and description from the Parts Data Package report
- Model number and serial number of your battery charger
- Quantity required

In lieu of replacement parts tables, all AT30s currently ship with a parts data package and custom drawings. Contact your sales representative to place an order for spare parts or replacement parts.

Table 3-1: REPLACEMENT PARTS

Symbol	Description	Factory Part Number				Rec. Spares
		12 Vdc	24 Vdc	48 Vdc	130 Vdc	
A1	Main Control PC Board assembly	EJ1243-10				Y
A5	Auxiliary Relay PC Board assembly (optional)	EJ1243-03				Y
A7	DC Filter assembly	see Table 3-2				
A8	Battery Eliminator Filter assembly (requires filtered charger)	see Table 3-3				
A10	Temperature Compensation Probe assembly	See Appendix B				
A15	Three Phase Gate Drive PC Board assembly	**see supplied Parts Data Package**				Y
A16	SCR Rectifier Module(s) - (Q1-Q6)	**see supplied Parts Data Package**				Y
A17	SCR Snubber Sub-Assembly	**see supplied Parts Data Package**				
C1	Filter Capacitor (standard)	**see supplied Parts Data Package**				Y
C2	Filter Capacitor (battery eliminator)	**see supplied Parts Data Package**				Y
C4	EMI Filter Capacitor	see VR6/C4				
C5	EMI Filter Capacitor	see VR7/C5				
CB1	AC Circuit Breaker (standard) 208/240 Vac	see Table 3-4				
CB1	AC Circuit Breaker (medium AIC) 208/240 Vac	see Table 3-6				
CB1	AC Circuit Breaker (high AIC) 208/240 Vac	see Table 3-8				
CB1	AC Circuit Breaker (standard) 480 Vac	see Table 3-5				
CB1	AC Circuit Breaker (medium AIC) 480 Vac	see Table 3-7				
CB1	AC Circuit Breaker (high AIC) 480 Vac	see Table 3-9				
CB2	DC Circuit Breaker (standard)	see Table 3-12				
CB2	DC Circuit Breaker (Medium AIC)	see Table 3-13				
CB2	DC Circuit Breaker (High AIC)	see Table 3-14				
CR1	Polarity Diode (25-50 Adc ratings)	RK0013-14				Y
CR1	Polarity Diode (75 Adc rating)	RK0014-14				Y
CR1	Polarity Diode (100 Adc rating)	RK0017-14				Y
CR1	Polarity Diode (125+ Adc rating)	**see supplied Parts Data Package**				Y

Symbol	Description	Factory Part Number				Rec. Spares
		12 Vdc	24 Vdc	48 Vdc	130 Vdc	
CR4	Free-Wheeling Diode (25-50 Adc ratings)	RK0013-14				Y
CR4	Free-Wheeling Diode (75 Adc rating)	RK0014-14				Y
CR4	Free-Wheeling Diode (100 Adc rating)	RK0017-14				Y
CR4	Free-Wheeling Diode (125+ Adc rating)	**see supplied Parts Data Package**				Y
F1 A/B/C	AC Input Fuses (208/240 Vac)	see Table 3-10				Y
F1 A/B/C	AC Input Fuses (480 Vac)	see Table 3-11				Y
F3/F4	DC Output Fuses	see Table 3-15				Y
L1	Main Inductor	see Table 3-16				
L2	Filter Inductor	see Table 3-17				
P5	Jumper for disabling Ground Detection circuit on Main Control PC Board (A1)	RC0100-00				
P7	Jumper for voltage selection on Auxiliary Relay PC Board (A5)	RC0100-00				
P9	Jumper for front panel lockout feature on Main Control PC Board (A1)	RC0100-00				
R1	Main DC Shunt	see Table 3-18				
R2	Current Rating Resistor	see Table 3-19				
R3	Power Supply (Ballast) Resistor	RJ0007-30 18Ω	RJ0035-27 100Ω	RJ0021-00 250Ω	RJ0023-03 750Ω	
R4	Positive External Scaling Resistor	RJ0056-48 3160Ω	RJ0056-81 6980Ω	RJ0075-14 14.0KΩ	RJ0075-56 38.3KΩ	
R6	Voltage (Crowbar) Resistor	RJ0063-76	RJ0064-11	RJ0064-41	RJ0064-80	
R9	Filter Capacitor (C1) Bleed Resistor	RJ0028-25	RJ0028-25	RJ0028-27	RJ0036-40	
R14	Negative External Scaling Resistor	RJ0074-48 3160Ω	RJ0074-81 6980Ω	RJ0075-14 14.0KΩ	RJ0075-56 38.3KΩ	
T1	Main Transformer (208/240 Vac)	see Table 3-20				
T1	Main Transformer (480 Vac)	see Table 3-21				
TB1-x	Input/output terminals (Style-5018) CU-AL compression lug for #14-6 AWG.	RC0056-18				
VR1	Output Surge Suppressor	EJ1132-01				Y
VR2	Input Surge Suppressor (208/240 Vac)	EJ1132-01				Y
VR2	Input Surge Suppressor (480 Vac)	EJ1132-02				Y
VR3	AC Input Lightning Arrestor	EJ1074-00				
VR4, VR5	Input Surge Suppressor (208/240 Vac)	EJ1132-01				Y
VR4, VR5	Input Surge Suppressor (480 Vac)	EJ1132-02				Y
VR6+C4	EMI Filter Network	EJ5021-01				Y
VR7+C5	EMI Filter Network	EJ5021-01				Y

Table 3-2: DC FILTER ASSEMBLIES - STANDARD (L2/C1/R9/CR1)

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-3: DC FILTER ASSEMBLIES - ELIMINATOR (C2) - REQUIRES STANDARD FILTER

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage (Vdc)			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-4: STANDARD AC CIRCUIT BREAKERS (CB1) - 208/240 Vac

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-5: STANDARD AC CIRCUIT BREAKERS (CB1) - 480 Vac

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Note: Standard BOMs for all ratings of the AT30 line are not yet available. For replacement parts, refer to the custom Parts Data Package supplied with the unit.

Table 3-6: MEDIUM AMPERE INTERRUPTING CAPACITY AC BREAKERS (CB1) - 208/240 Vac

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-7: MEDIUM AMPERE INTERRUPTING CAPACITY AC CIRCUIT BREAKERS (CB1) - 480 Vac

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-8: HIGH AMPERE INTERRUPTING CAPACITY AC CIRCUIT BREAKERS (CB1) - 208/240 Vac

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-9: HIGH AMPERE INTERRUPTING CAPACITY AC CIRCUIT BREAKERS (CB1) - 480 Vac

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Note: Standard BOMs for all ratings of the AT30 line are not yet available. For replacement parts, refer to the custom Parts Data Package supplied with the unit.

Table 3-10: AC INPUT FUSES (F1A/F1B/F1C) - 208/240 Vac

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-11: AC INPUT FUSES (F1A/F1B/F1C) - 480 Vac

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-12: STANDARD DC CIRCUIT BREAKERS (CB2)

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-13: MEDIUM AMPERE INTERRUPTING CAPACITY DC CIRCUIT BREAKERS (CB2)

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Note: Standard BOMs for all ratings of the AT30 line are not yet available. For replacement parts, refer to the custom Parts Data Package supplied with the unit.

Table 3-14: HIGH AMPERE INTERRUPTING CAPACITY DC CIRCUIT BREAKERS (CB2)

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-15: DC OUTPUT FUSES (F3/F4)

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-16: MAIN INDUCTOR (L1)

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-17: FILTER INDUCTOR (L2)

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Note: Standard BOMs for all ratings of the AT30 line are not yet available. For replacement parts, refer to the custom Parts Data Package supplied with the unit.

Table 3-18: DC SHUNT RESISTOR (R1)

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	200 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
30 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	250 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
40 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	300 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
50 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	400 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
75 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	500 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
100 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	600 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
125 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	800 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
150 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	1,000 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ

Table 3-19: CURRENT RATING RESISTOR (R2)

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	200 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
30 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	250 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
40 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	300 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
50 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	400 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
75 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	500 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
100 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	600 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
125 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	800 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
150 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	1,000 Adc	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ	AA0000-00 00.0 kΩ
Connector terminal extraction tool					Molex P/N 11-03-0038				

Note: Standard BOMs for all ratings of the AT30 line are not yet available. For replacement parts, refer to the custom Parts Data Package supplied with the unit.

Table 3-20: MAIN TRANSFORMER (T1) - 208/240 Vac

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Table 3-21: MAIN TRANSFORMER (T1) - 480 Vac

Ampere Rating	Output Voltage				Ampere Rating	Output Voltage			
	12 Vdc	24 Vdc	48 Vdc	130 Vdc		12 Vdc	24 Vdc	48 Vdc	130 Vdc
25 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	200 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
30 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	250 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
40 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	300 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
50 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	400 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
75 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	500 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
100 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	600 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
125 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	800 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00
150 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00	1,000 Adc	AA0000-00	AA0000-00	AA0000-00	AA0000-00

Note: Standard BOMs for all ratings of the AT30 line are not yet available. For replacement parts, refer to the custom Parts Data Package supplied with the unit.

APPENDIX A

SPECIFICATIONS

Except as noted, all specifications apply at:
77° F / 25 °C, nominal ac line voltage & nominal Float voltage

Specification	Conditions	12 Vdc	24 Vdc	48 Vdc	130 Vdc
Output voltage regulation	Vac +10%, -12% 0 to 100% load Temp. 32-122° F / 0-50° C Freq. 60 ± 3 Hz	± 0.25%			
Transient response	20-100% load change, with battery connected	Output voltage change ± 4% maximum Recovery to ± 2.0% in 200 ms Recovery to ± 0.5% in 500 ms			
Efficiency	All ratings	82-90%			

Output ripple voltage (per **NEMA PE5-1996**)	Unfiltered, with battery	2% (typ.) at battery terminals	
	Filtered, with battery	30 mV rms (max.) at battery terminals	
	Filtered, without battery	1% rms (typ.)	
	With battery eliminator option (without battery)	30 Mv	100 mV

Current limit	Adjustable	50-110 % of rated output current
Soft start	0 to 100% load	4 seconds

Voltage adjustment ranges	Float	11.5-14.5	23.0-29.5	46-58	115-140
	Equalize	12-15.5	24-31	48-61	123-145
	High DC Voltage alarm	12-19	24-38	48-76	120-175
	Low DC Voltage alarm	7-13	15-25	36-50	80-126
Voltmeter range (Vdc)		0 - 21	0 - 42	0 - 75	0 - 195
Ammeter range (Adc)	25 Adc nom. output	0 - 30			
	30-100 Adc nom. output	0 - 150			
	125-400 Adc nom. output	0 - 500			
	500-800 Adc nom. output	0 - 1000			
	1,000 Adc nom. output	0 - 1,200			

Surge withstand capability	Test per ANSI C37.90.1-1989	No erroneous outputs
Reverse current from battery	AC input power failure, no options installed	90 mA maximum
Audible noise	Average for 4 sides 5ft / 1.5m from charger	Less than 62 dB(A)
Cooling		Natural convection
Ambient temperature	Operating	32-122° F / 0-50° C
Elevation		3,000ft / 1,000m without derating
Relative humidity		0 to 95% non-condensing

Alarm relay contact rating	120 Vac / 125 Vdc	0.5A resistive

FIELD INSTALLABLE ACCESSORIES AND OPTIONS

All accessories/options listed below are available in kits for field installation. Kits contain all parts and hardware with detailed installation instructions. To order accessories/options, please provide the following information for each kit:

- Factory part number and description, from the table below
- Model number and serial number of your battery charger
- Quantity required

Contact your sales representative to place an order for accessories/options.

Description	Kit Part Number
Auxiliary Alarm Relay PC Board (A5)	EI0213-02
Standard DC Output Filtering (30 mV with battery)	contact your sales rep.
Battery Eliminator Filtering	contact your sales rep.
External Temperature Compensation Probe Assembly (A10)	see table below
AC Input Lightning Arrestor (VR3)	EJ1074-00
Copper Ground Buss with one (1) box lug	contact your sales rep.
Wall-Mounting Kit for Style-5018 Cabinet	EI5008-00
23-24in Relay Rack-Mounting Kit for Style-5018	EI0193-03
Drip Shield Assembly for Style-5018 Cabinet	EI0191-02
DNP3 Level 2 / Modbus Communications Module	see Appendix E

External Temperature Compensation Probe Assembly

The temperature compensation assembly consists of two (2) components:

1. To order a replacement probe (or puck), request part number EJ5032-00. This probe is good for all charger output voltages and all battery types.

2. The standard temperature compensation assembly is supplied with a 25ft / 7.6m interconnection cable. If you need a longer cable, order it from the table below, which also shows the ordering part number for a complete probe kit.

Temperature Compensation Probe Kits

Cable Length (feet / m)	**Kit Part Number** (includes probe)	**Replacement Cable Part Number**
25 / 7.6	EJ5033-00	EJ5011-00
50 / 15.2	EJ5033-01	EJ5011-01
100 / 30.5	EJ5033-02	EJ5011-02
200 / 61.0	EJ5033-03	EJ5011-03

Use a single cable assembly. Do not try to splice cables together to increase the length.

CUSTOM DRAWINGS

In lieu of standard drawings within this manual, all AT30s currently ship with a custom Record Drawing Package, consisting of the following documents:

- **JE5075** AT30 Series Battery Charger Drawing List / Data Nameplate Detail

Use this document to track the revision levels of your custom drawing package and to confirm the ratings listed on the AT30 data nameplate.

- **JE508x** AT30 Series Battery Charger Outline Drawing

Refer to this document when reviewing the enclosure type, size, weight, and mounting dimensions.

- **JE508x** AT30 Series Battery Charger Internal Component Layout Drawing

Refer to this document when identifying internal components of the AT30 and sizing input/output wiring.

- **JE5091** AT30 Series Instrument Panel / PC Board Detail

Refer to this document when reviewing the layout of the instrument panel and identifying components of the printed circuit boards (A1, A15 & A5).

- **JE5092** AT30 Series Battery Charger Schematic

Refer to this document when reviewing the electrical circuitry of the AT30 battery charger and confirming component ratings.

- **JE5093** AT30 Series Battery Charger Connection Diagram

Refer to this document when reviewing (or trouble-shooting) the internal wiring of AT30 battery charger.

All drawings listed on the AT30 Series Battery Charger Drawing List / Data Nameplate Detail (**JE5075**-######) are a complete package and should not be separated from one another.

These drawings are created ***specifically*** for the AT30 battery charger featuring the serial number listed on the data nameplate detail, and should not be used as reference material for any other AT30 battery charger.

Electronic versions of these documents are available in AutoCAD (DWG) format and/or Adobe Acrobat (PDF) format. Please contact your sales representative for document availability.

APPENDIX D

RECOMMENDED FLOAT AND EQUALIZE VOLTAGES

This table contains suggested values for commonly used batteries. Consult your battery manufacturer's documentation for specific values and settings for your battery type.

Battery Cell Type		Recommended Float Voltage/cell	Recommended Equalize Voltage/cell
Lead-Acid Types	Antimony 1.215 Sp. Gr.	2.17	2.33
	Antimony 1.250 Sp. Gr.	2.20	2.33
	Calcium 1.215 Sp. Gr.	2.25	2.33
	Calcium 1.250 Sp. Gr.	2.29	2.33
	Absorbed / Gelled Electrolyte * (sealed Lead-Acid type)	2.25	*
Nickel Cadmium		1.42	1.47

* Sealed Lead-Acid battery types should not be used in ambient temperatures above 95° F / 35° C, and should not normally be equalized. Please consult your battery manufacturer's documentation for specific equalizing recommendations.

TEMPERATURE COMPENSATION

If batteries are to see temperature variations during charging, a temperature compensation option is recommended. If this option is not part of your charger, manual adjustments should be made. Refer to the equation and table below for temperature-adjusted voltages.

temperature-adjusted voltage = charge voltage x K

Temperature (°F)	Temperature (°C)	**K** (Lead Acid)	**K** (Nickel Cadmium)
35	1.7	1.058	1.044
45	7.2	1.044	1.034
55	12.8	1.031	1.023
65	18.3	1.017	1.013
75	23.9	1.003	1.002
77	25.0	1.000	1.000
85	29.4	0.989	0.992
95	35.0	0.975	0.981
105	40.6	0.961	0.970

APPENDIX E

COMMUNICATIONS MODULE

Your AT30 Battery Charger has provisions for an optional Communications Module that allows the user to remotely monitor and control the charger over a serial connection. This PC Board Assembly (A12) supports DNP3 Level 2 and Modbus protocols over RS-232 or RS-485 half-duplex. The system can be used with a modem for telephone communications. All features of the AT10.1's front instrument panel are accessible remotely, using this option. SCADA (Supervisory Control And Data Acquisition) systems will be able to control, monitor and log the events of the battery charger.

The standard Communications Module kit (**EJ5037-XX**) includes the Communications PC Board (A12), an external power supply assembly (A14), a separate AT Series Communications Module Operations Manual (**JA5026-00**), and field-retrofit instructions. The Communications Module Operations Manual, along with a sales catalog cut sheet, is freely available for download from the web site featured on the back cover of this manual. A compatible industry-standard modem and modem cable are also available. Contact your sales representative to place an order for the AT Series Battery Charger Communication Module. Refer to the table below for ordering information.

Description	Part No.
Communications Module for **12 Vdc** AT30	EJ5037-01
Communications Module for **24 Vdc** AT30	EJ5037-02
Communications Module for **48 Vdc** AT30	EJ5037-03
Communications Module for **130 Vdc** AT30	EJ5037-04
Compatible Modem Option	PM5005-00
10ft / 3.05m Modem Cable	EH5026-00
25ft / 7.62m Modem Cable	EH5026-01
50ft / 15.24m Modem Cable	EH5026-02

CUSTOMER NOTES

MANUAL REVISION:

The text and graphics contained within this manual are controlled by the battery charger manufacturer's internal part number (**JA5030-00**). The revision level of this manual's text and graphics are featured in the electronic filename listed below. The revision dates are also listed below and supercede all other available dates. The first two and last two pages of this manual are reserved for company-specific front and back cover artwork. Any revision levels, revision dates or document numbers featured on the first two and last two pages of this manual refer to the cover artwork only.

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ON-LINE AVAILABILITY:

Electronic versions of this manual and/or any custom or standard drawings for the AT30 Series Battery Charger are available online. Saved in Adobe Acrobat Portable Document Format (PDF), they are readily available for downloading and printing. Please contact your sales representative for document availability or see the manufacturer's web site listed on the back cover of this manual.

QUICK OPERATION

For unpacking and installation instructions, see section 1 on page 2 in this manual

Startup

- Turn on the dc breaker, labeled “DC OUTPUT”.
- Turn on the ac breaker, labeled “AC INPUT”.

To learn how to use the equalize timers, see sections 2.2.4 on page 29 and 2.3.3 on page 34

Changing between Float and Equalize Modes

- Press the CHRG MODE key to toggle from Float mode to Equalize mode. Press again to toggle back to Float. The green or yellow indicator identifies the current mode.

For details on setting parameters, see section 2.3 starting on page 32

Setting

Float Voltage
Equalize Voltage
Equalize Timer
High DC Voltage
Low DC Voltage

If you don’t press any key for 25 seconds, the AT10.1 resumes normal operation automatically

- Press the EDIT ENTER key. The **DC VOLTS** and **FLOAT** indicators light, and the digital display flashes the present float voltage setting.
- Press the ⬆ or ⬇ key until the digital display indicates the desired float voltage.
- Press the EDIT ENTER key to save the new setting internally.
- The **EDIT** sequence advances to the equalize voltage as shown by the front panel indicators. Repeat the above steps until you have set all parameters.